FINAL

Coal Combustion Waste Impoundment

Round 7 - Dam Assessment Report

La Cygne Generating Station

Bottom Ash Settling, Upper and Lower AQC Ponds

Kansas City Power & Light Company

La Cygne, Kansas

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

Dewberry & Davis, LLC
Fairfax, Virginia

Under Contract Number: EP-09W001727

June 2011

FINAL

INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards of coal combustion waste from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008 flooded more than 300 acres of land, damaging homes and property. In response the U.S. EPA is assessing the stability and functionality of the coal combustion ash impoundments and other management units across the country and, as necessary, identifying any needed corrective measures.

This assessment of the stability and functionality of the Kansas City Power and Light (KCP&L) La Cygne Generating Station's Bottom Ash Settling Pond and Upper and Lower AQC Ponds is based on a review of available documents and on the site assessment conducted by Dewberry personnel on Tuesday, 21 September 2010. We found the supporting technical documentation adequate (Section 1.1.3). As detailed in Section 1.2, there are several recommendations based on field observations that may help to maintain a safe and trouble-free operation.

In summary, the La Cygne Generating Station's Upper and Lower AQC Ponds are **SATISFACTORY** for continued safe and reliable operation, with no recognized existing or potential management unity safety deficiencies.

PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures; to note the extent of deterioration, status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as having a Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety).

In February 2009, the EPA sent its first wave of letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion waste. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Utility companies provided information on the size, design, age and the amount of material placed in the units. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

The purpose of this report is to evaluate the condition and potential of waste release from management units. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit owner. After the field visit additional information was received by Dewberry & Davis LLC about the La Cygne Generating Station's Bottom Ash Settling Pond and Upper and Lower AQC Ponds. This information was reviewed and incorporated in this final report.

Factors considered in determining the hazard potential classification of the management units(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed of in these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion waste management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

FINAL

Table of Contents

Page

FINAL

1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit, 21 September 2010, and review of technical documentation provided by Kansas City Power & Light (KCP&L) Company.

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

Slope stability and seepage analyses for the embankments were performed and were provided for review. A Geotechnical Evaluation of AQC Ponds – Kansas City Power & Light: La Cygne Generating Station; September 2010 by URS Corporation was provided for review and is included in Appendix A: Document 1. The embankments, inlets, outlets and spillway (Lower AQC Pond) of each of the three ponds appear to be structurally sound based on Dewberry engineers' observations during the site visit and review of the evaluation document. The structural soundness of the management units is satisfactory for continued service.

Bottom Ash Settling Pond
This pond was determined to be incised into the site. The pond and its associated appurtenances appeared to be in good condition and structurally sound. Since it was incised, further evaluation of the unit was not performed.

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

Hydrologic/Hydraulic Safety analyses for the embankments were performed. Any breach of the management units would spill into Lake La Cygne, an onsite cooling lake. The results show that all spillage would be contained within Lake La Cygne.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The supporting technical documents appear to be adequate.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

The description of the management units provided by KCP&L was an accurate representation of what was observed in the field.

1.1.5 Conclusions Regarding the Field Observations

Dewberry staff was provided access to all areas in the vicinity of the management units required to conduct a thorough field observation. The team observed woody, brushy vegetation growth on the interior levee of the Upper AQC Pond. This issue needs to be addressed in the near future before significant tree growth develops.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

Tree growth is the only maintenance and operation concern.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The current instrumentation monitoring plan for embankment performance of the management units is adequate. Additionally, daily drive-by inspections are conducted by plant personnel. These inspections are documented; however piezometer readings are not documented adequately.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

The facility is **SATISFACTORY** for continued safe and reliable operation. No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Field Observations

It is recommended that Kansas City Power & Light remove the brushy vegetation from the interior slope of the Upper AQC Pond. This brush needs to be removed from the levees and within 25 feet from the toe of the levee slope. This should be done before trees can develop.

FINAL

1.2.2 Recommendations Regarding the Surveillance and Monitoring Program

It is recommended that KCP&L develop a regular surveillance program that logs the location of field monuments and checks piezometer readings.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

Paul M. Ling, JD, PE – Environmental Manager – KCP&L
Theresa Goin – Environmental Compliance Administrator – KCP&L
Mark C. Adams, PE – Sr. Civil/Power Production Engineer – KCP&L
Gordon Turner – Fuel Yard Superintendent – KCP&L
Michael J. McLaren, SE, PE – Structural Engineer – Dewberry
Andrew J. Cueto, PE, PMP – Civil Engineer – Dewberry

1.3.2 Acknowledgement and Signature

We acknowledge that the management unit referenced herein has been assessed on September 22, 2010.

STATE OF MISSOURI
MICHAEL J. McLAREN
NUMBER
PE-2007032432
PROFESSIONAL ENGINEER

Michael J McLaren, PE (MO 2007032432) 3-15-11

Andrew Cueto, PE, PMP

FINAL

2.0 DESCRIPTION OF THE COAL COMBUSTION WASTE MANAGEMENT UNIT(S)

2.1 LOCATION AND GENERAL DESCRIPTION

KCP&L operates the La Cygne Generating Station, a coal fired electric generation plant located in Linn County, Kansas, more particularly described as follows:

> Section 27 except the West Y2 of the Northwest ~ thereof; the East ~ of the Northeast ~ of Section 33; and the North Y2 of Section 34, all in Township 19 South, Range 2S East, Linn County, Kansas.

La Cygne is located in east central Kansas approximately fifty miles south of Kansas City. The La Cygne Generating Station location is shown in Figure 2.1.

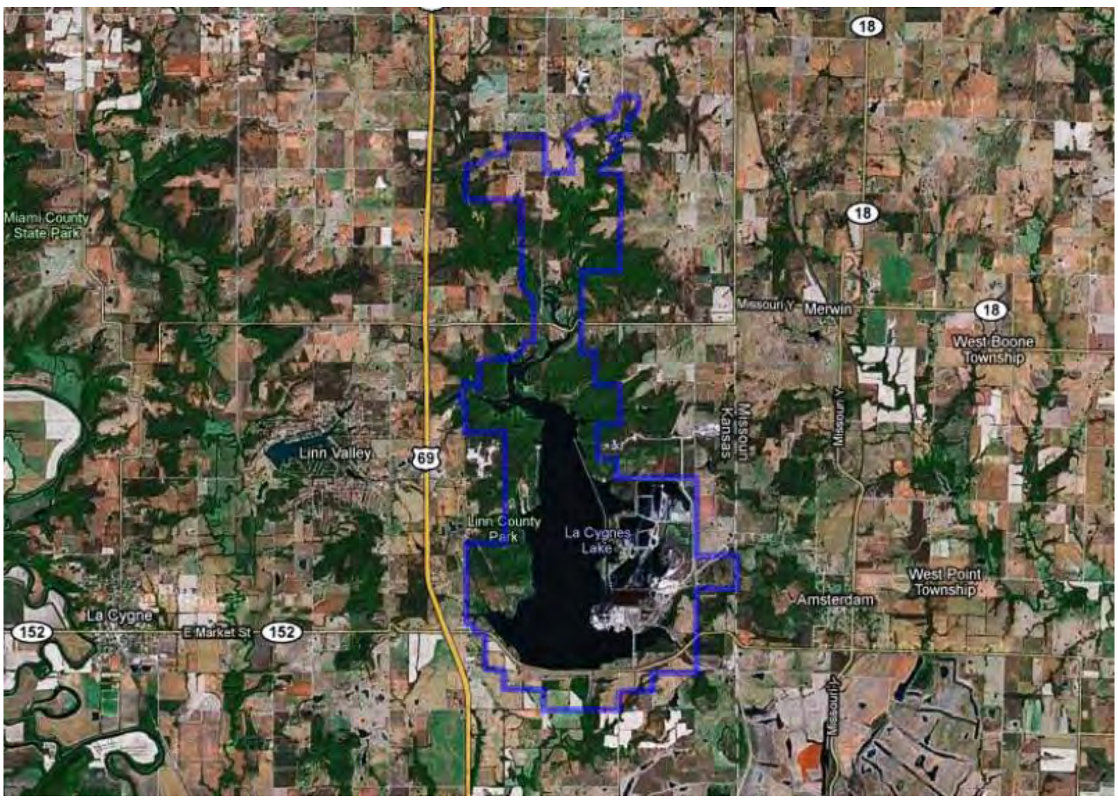


Figure 2-1. La Cygne Generating Station Location

The power plant consists of two coal-fired generating units, presently rated at 848 megawatts and 715 megawatts, which burn about 5,000,000 tons of coal per year, mostly western low-sulfur coal. The 7,500-acre site contains a 2,600-acre cooling water lake, the generation station, and 751 acres permitted for on-site resource storage, recycling and waste disposal.

FINAL

La Cygne Generating Station has two main impoundments containing waste materials from their air quality control systems at the station and a third smaller bottom ash pond. These are referred to as air quality control (AQC) ponds, consisting of the Lower AQC pond, the Upper AQC pond, and the Bottom Ash Pond. The pond locations are shown in Figure 2.2.

Figure 2-2

The Lower AQC pond receives flue gas desulfurization sludge and the Bottom Ash Pond receives bottom ash from the power plant. The ponds were built as part of the original power plant construction. The design plans for these ponds were prepared by Ebasco Services Incorporated and are dated in the early 1970s. Selected sheets showing design details are included in Appendix A.

In 1980, flue gas desulfurization sludge was directed to the Upper AQC pond. Overflow from the Upper AQC pond is directed to the Lower AQC pond through the upper pond's principal spillway. The ponds are managed as a non-discharge facility. Water levels are managed through enhanced evaporation and by drawing water from the Lower AQC pond for power plant operations.

Both the Upper and Lower AQC ponds are bounded by earth fill embankments which provide containment of the ash materials. The dimensions and parameters for the various embankments are listed in Table 2.1.

Table 2.1: Summary of Dam Dimensions and Size	
	Bottom Ash Pond (incised into ground)
Dam Height (ft)	12 (above lake level)
Crest Width (ft)	50
Length (ft)	1700
Surface Area (ac)	1.7
Side Slopes (upstream) H:V	2:1
Side Slopes (downstream) H:V	n/a
	Lower AQC Pond
Dam Height (ft)	24
Crest Width (ft)	15
Length (ft)	10,500
Surface Area (ac)	151
Side Slopes (upstream) H:V	2:1
Side Slopes (downstream) H:V	2.5:1

Table 2.1: Summary of Dam Dimensions and Size (cont.)	
	Upper AQC Pond
Dam Height (ft)	45
Crest Width (ft)	16
Length (ft)	18,000
Surface Area (ac)	332
Side Slopes (upstream) H:V	2:1
Side Slopes (downstream) H:V	2.5:1

2.2 SIZE AND HAZARD CLASSIFICATION

The classification for size based on dam height and storage capacity is provided in Table **2.2a**. For the purpose of determining project size, the maximum storage elevation may be considered equal to the top of dam elevation. Size classification is determined by either storage or height, whichever gives the larger size category.

Table 2.2a: USACE ER 1110-2-106 Size Classification		
	Impoundment	
Category	**Storage (Ac-ft)**	**Height (ft)**
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

The Hazard Potential Classification System for Dams is based on the probable loss of human life and the potential for economic losses, environmental damage, and/or disruption to lifelines caused by failure of mis-operation of a dam or its appurtenances. This Hazard Potential Classification System for Dams recognizes that the failure or mis-operation of any dam or water-retaining structure represents a potential danger to downstream life and property. The classification for Hazard is presented in Table **2.2b** and is based on the FEMA Federal Guidelines for Dam Safety.

Table 2.2b: FEMA Federal Guidelines for Dam Safety Hazard Classification		
	Loss of Human Life	**Economic, Environmental, Lifeline Losses**
Low	None Expected	Low and generally limited to owner
Significant	None Expected	Yes
High	Probable. One or more expected	Yes (but not necessary for classification)

Table **2.2c** classifies of each of the impoundments with respect to Size and Hazard Classification.

Table 2.2c: Summary of Dam Classifications						
Pond/Dam Name	**Size Classification**			**Hazard Classification**		
	Small	**Intermediate**	**Large**	**Low**	**Significant**	**High**
Bottom Ash Pond	X			N/A		
Lower AQC Pond	X			X		
Upper AQC Pond		X		X		

The hazard risk for the Lower AQC and Upper AQC Ponds was determined to be **LOW** due to the fact that a catastrophic failure of the two ponds would be contained within the La Cygne Generating Station's cooling water lake. Therefore, there would be no economic, environmental, lifeline losses to outside property owners.

2.3 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

The Upper AQC pond receives scrubber sludge sluiced from Unit 1. The Lower AQC pond is the original pond into which Unit 1 scrubber sludge was deposited. It now serves as a tertiary decant basin and surge pond for recycling AQC system waters. The Bottom Ash Pond receives bottom ash from Units 1 and 2. The Pond is incised into the pad originally constructed for the facility. It is dredged regularly and dredged materials are taken to the dry landfill on site.

Currently, 192 acre-feet of solid waste are disposed annually. Sometime after 2010, sales of recyclable materials will cease and all solid waste products will be disposed of within the AQC ponds or the dry ash landfill. Starting in 2011, an estimated 316 acre-feet of waste will be disposed of on an annual basis (equivalent to 627,000 tons of solid waste) at La Cygne. Assuming current waste disposal rates remain unchanged and that recycled sales will not be pursued after 2010, the solid waste disposal areas should reach final capacity around 2058.

Table 2.3: Maximum Capacity of Unit	
Bottom Ash Pond (incised)	
Surface Area (acre)[1]	1.7
Current Storage Capacity (cubic yards)[1]	19,000
Current Storage Capacity (acre-feet)	11.8
Total Storage Capacity (cubic yards)[1]	19,000
Total Storage Capacity (acre-feet)	11.8
Crest Elevation (feet)	852.5
Normal Pond Level (feet)	850.0
Lower AQC Pond	
Surface Area (acre)[1]	151
Current Storage Capacity (cubic yards)[1]	2,500,000
Current Storage Capacity (acre-feet)	1,549.6
Total Storage Capacity (cubic yards)[1]	2,500,000
Total Storage Capacity (acre-feet)	1,549.6
Crest Elevation (feet)	864
Normal Pond Level (feet)	861
Upper AQC Pond	
Surface Area (acre)[1]	332
Current Storage Capacity (cubic yards)[1]	6,250,000
Current Storage Capacity (acre-feet)	3874
Total Storage Capacity (cubic yards)[1]	12,500,000
Total Storage Capacity (acre-feet)	7,747.9
Crest Elevation (feet)	890
Normal Pond Level (feet)	887

[1] *Measured at maximum water level.*

2.4 PRINCIPAL PROJECT STRUCTURES

2.4.1 Earth Embankment

Lower AQC Pond - Plans prepared by Ebasco Services show that the Lower AQC Pond was formed by a 10,500 ft side hill embankment. The plans do not provide details on the embankment materials; it is assumed that the embankment consists entirely of compacted native clay. No internal drainage for the embankment is shown.

Upper AQC Pond - is formed by an 18,000 ft embankment. The design documents show that a typical embankment section has an impervious upstream section and a random zone on the downstream slope. The upstream and downstream slopes are inclined at 2.5H to 1V. The width of the dam crest varies with the height of the embankment, ranging from 13 feet where the embankment is shortest to 18 feet where the embankment is tallest. The height of the embankment varies from approximately 15 feet on the northwest side to about 45 feet on the southeast side.

It is reported that the borrow materials for the embankment were obtained from within the reservoir. Borings drilled within the reservoir during the design investigation show that the general subsurface profile consisted of medium to high plastic residual clays over shale bedrock. The upper portion of the shale was weathered and plastic. With depth, the weathering decreased and the shale became harder and retained its laminated structure. The residual clays and weathered, plastic shale were excavated and used to construct the embankment. The embankment is zoned with an internal impervious zone, an external random zone, and a horizontal blanket drain near the downstream toe.

The embankment was designed and constructed with an internal drainage system to intercept seepage through the embankment. The drain was constructed of freely draining bottom ash with little fines and a gradation like a poorly graded medium to coarse sand. Internal drainage is provided along the entire length of the embankment.

2.4.2 Outlet Structures

The Lower AQC Pond is designed as a non-discharge unit. An emergency overflow spillway was provided for the Lower AQC Pond. Intake pumps for process water and pumps capable of delivering water to the Upper AQC pond or to the power plant are used as primary control of reservoir levels in the Lower AQC pond.

The Upper AQC pond principal spillway is a 6 ft wide by 9 ft long by 22 ft high concrete riser fitted with stop logs (see Appendix A, Doc 12). As the solids and water level in the pond increase over time, stop logs are added or removed to manage water levels within the impoundment. The concrete riser is connected to a 30-inch diameter corrugated metal pipe (CMP) that discharges into a basin at the toe of the embankment.

The basin discharges into the lower AQC pond. The plans show that three anti-seep collars are present along the alignment of the CMP. The collars are cast-in-place concrete and are shown to be 8 feet high by 12 feet wide and 9 to 11 inches thick.

The emergency spillway consists of a 50-foot-wide riprap lined channel over the embankment crest and the downstream slope. The opening for the spillway is shown to be 3 feet lower than the top of the embankment. The emergency spillway does not discharge into the Lower AQC pond, but rather discharges into a drainage swale that slopes to the west.

2.5 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

With its rural location and the fact that any breach of the coal combustion waste management units would release waste onsite to Lake La Cygne, there is no critical infrastructure downgradient from the ponds.

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

3.1 SUMMARY OF REPORTS ON THE SAFETY OF THE MANAGEMENT UNIT

KCP&L provided six reports and documents documenting the safety and management practices of the La Cygne management units. The documents are:

1. Final Geotechnical Evaluation Report.pdf
2. Breach Impact Analysis Memo.pdf
3. Safe Water Level Study Report.pdf
4. KDHE 7-13-2010 Landfill Inspection.pdf
5. La Cygne Upper and Lower AQC Pond Inspection, March 2009.pdf
6. La Cygne AQC Pond Inspection, Jan 1986.pdf

In summary, the reports and other documentation concluded that the structures appeared to be performing adequately and that no conditions were observed that would adversely compromise the continued safe operation of the management units.

3.2 SUMMARY OF LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PERMITS.

The State of Kansas regulates the management units dually under the Kansas Department of Health And Environment: Division of Environment Waste Management Program and the Kansas Department of Agriculture: Division of Water Resources, Water Structures Program. Both current inspection reports indicated the facilities were compliant with their permits.

3.3 SUMMARY OF SPILL/RELEASE INCIDENTS

The following spill/unpermitted release from the dam occurred:

- <u>Early-mid July 2007 - AQC ponds overflowed emergency spillway</u>
  The La Cygne Generating Station and surrounding area experienced high rainfall for the months of June and July 2007. As a result, impounded water in the Air Quality Control (AQC) ponds flowed over an emergency spillway which was activated in order to protect the embankments and avoid a catastrophic failure of the ponds. The impoundments operated normally as no-discharge evaporative structures that do not have permitted discharge outfalls under the Station's 2004 NPDES permit (Kansas Permit Number I-MC18-P001; Federal Permit Number KS0080071). Water was released from the AQC ponds through the emergency spillway during early-mid July 2007. The anticipated discharge was reported to the Kansas Department of Health and Environment: Bureau of Water by telephone on July 2, 2007.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

Plans originally prepared by Ebasco Services, dated 02 October 1973, show that the Lower AQC pond is formed by a 10,500 ft embankment. The plans do not provide details on the embankment materials; it is assumed that the embankment consists entirely of compacted native clay. No internal drainage for the embankment is shown. It was built in accordance with engineering plans and specifications and its construction was overseen by an independent construction manager. The plans detailed clearing and grubbing of the construction site, as well as the keying in of the embankment as it was compacted.

The Upper AQC pond is formed by an approximately 18,000 ft embankment. The Woodward Clyde Inc. design documents, dated 30 January 1979, show that a typical embankment section has an impervious upstream section and a random zone on the downstream slope.

The embankment was designed and constructed with an internal drainage system to intercept seepage through the embankment. The drainage blanket material consists of coarse, pervious bottom ash generated at the station.

4.1.2 Significant Changes/Modifications in Design since Original Construction

The historical information provided by KCP&L and site observations indicate that embankments have not been altered since construction.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

The historical information provided by KCP&L indicate that embankments have been stable since construction with no indications of cracking, bulging or other indications of instability that might jeopardize the integrity of the ponds.

Two separate shallow slides, one in 1987 and the other in 1995, occurred on the downstream slope of the Upper AQC pond. On both occasions, the failure scarp was below the crest of the dam. Repairs implemented by KCP&L involved removal of the disturbed material.

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

AQC sludge from Unit 1 is piped directly to the Upper AQC pond where the solids settle out. The outfall locations are moved within the pond to direct sedimentation to the desired locations. The Upper AQC pond is permitted as a non-discharge pond.

KCP&L irrigates the sludge deltas that have formed for the purpose of water evaporation. Water within the Upper AQC pond is pumped into a series of pipes equipped with spray bars that send the water out as a mist, thereby increasing evaporation. The irrigation system is operated seasonally, typically shutting down during the winter months due to icing. Evaporation rates have been increased by construction of internal dikes within the pond. These dikes form shallow flat deltas that increase shallow surface water areas, thereby increasing AQC pond evaporation. The internal dikes are constructed entirely of recycled waste.

The Lower AQC pond receives water from the Upper AQC pond. The Lower AQC pond water is used as make-up water for scrubber operation and is permitted as a non-discharge pond.

4.2.2 Significant Changes in Operational Procedures and Original Startup

The historical information provided by KCP&L and site observations indicate that there have not been significant changes in operational procedures from original startup.

4.2.3 Current Operational Procedures

In order to increase the operating life of the Upper AQC pond, solids deposited in the pond are excavated, stacked within the AQC pond to dry, then transported in trucks to a landfill. KCP&L estimates that approximately 5,000-25,000 tons of solids per month are transported from the Upper AQC pond to the dry landfill. The Upper AQC pond receives water from the AQC sludge and from precipitation. Outflows include evaporation, water for the AQC pump seal, and planned discharges to the Lower AQC pond.

FINAL

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Michael McLaren, P.E. and Andrew Cueto, P.E. performed a site visit on Tuesday, September 21, 2010 in company with the participants listed in Section 1.3.1.

The site visit began at 8:30 AM. The weather was warm and cloudy. Photographs were taken of conditions observed. Please refer to photographs in Appendix B and the Dam Inspection Checklist in Appendix C. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit.

The overall assessment of the dam was that it was in satisfactory condition and no significant findings were noted.

5.2 EARTH EMBANKMENT 1

5.2.1 Crest

Upper AQC Pond

The crest of the dike had no signs of depressions, tension cracks, or other indications of settlement or shear failure, and appeared to be in satisfactory conditions. Figure 5.2.1-1 shows the conditions of the crest of southern dike of the Upper AQC Pond.

Figure 5.2.1-1

Figure 5.2.1-2 shows the conditions of the crest of the eastern dike of the Upper AQC Pond.

Figure 5.2.1-2

Figure 5.2.1-3 shows the conditions of the crest of the northern dike of the Upper AQC Pond.

Figure 5.2.1-3

FINAL

Figure 5.2.1-4 shows the conditions of the crest of the western dike of the Upper AQC Pond.

Figure 5.2.1-4

Lower AQC Pond

The crest of the dike had no signs of depressions, tension cracks, or other indications of settlement or shear failure, and appeared to be in satisfactory conditions. Figure 5.2.1-5 shows the conditions of the crest of southern dike of the Upper AQC Pond.

Figure 5.2.1-5

FINAL

Figure 5.2.1-6 shows the conditions of the crest of western dike of the Upper AQC Pond.

Figure 5.2.1-6

5.2.2 Upstream/Inside Slope

Upper AQC Pond

The inside slope of the south dike had no observed scarps, sloughs, bulging, cracks, or depressions or other indications of slope instability or signs of erosion. Figure 5.2.2-1 shows the general condition of the inside slope of the south dike.

Figure 5.2.2-1

The inside slope of the eastern and northern dikes had no observed scarps, sloughs, bulging, cracks, or depressions or other indications of slope instability or signs of erosion. However, a large majority of the slope was obstructed due to heavy vegetative cover. The vegetative cover was intentionally placed by KCP&L personnel to increase the evapotranspiration rate within the pond.

Figure 5.2.2-2 shows the general condition of the inside slope of the east and north dikes.

Figure 5.2.2-2

The inside slope of the west dike had no observed scarps, sloughs, bulging, cracks, or depressions or other indications of slope instability or signs of erosion.

FINAL

Figure 5.2.2-3 shows the general condition of the inside slope of the west dike.

Figure 5.2.2-3

5.2.3 Downstream/Outside Slope and Toe

Upper AQC Pond

The down-gradient slope of the Upper AQC Pond southern dike is vegetated with grass. No major scarps sloughs, bulging, cracks, depressions, or other indications of slope instability or signs of seepage were observed.

Figure 5.2.3-1 shows a representative section of the embankment.

Figure 5.2.3-1

The down-gradient slope of the Upper AQC Pond eastern dike is vegetated with grass. No major scarps sloughs, bulging, cracks, depressions, or other indications of slope instability or signs of seepage were observed.

Figure 5.2.3-2 shows a representative section of the embankment.

Figure 5.2.3-2

The down-gradient slope of the Upper AQC Pond northern dike is vegetated with grass. No major scarps sloughs, bulging, cracks, depressions, or other indications of slope instability or signs of seepage were observed. Figure 5.2.3-3 shows a representative section of the embankment.

Figure 5.2.3-3

FINAL

The down-gradient slope of the Upper AQC Pond western dike is vegetated with grass. No major scarps sloughs, bulging, cracks, depressions, or other indications of slope instability or signs of seepage were observed. Figure 5.2.3-4 shows a representative section of the embankment.

Figure 5.2.3-4

Lower AQC Pond

The down-gradient slope of the Lower AQC Pond southern dike is vegetated with grass. No major scarps sloughs, bulging, cracks, depressions, or other indications of slope instability or signs of seepage were observed. Figure 5.2.3-5 shows a representative section of the embankment.

Figure 5.2.3-5

The down-gradient slope of the Lower AQC Pond western dike is vegetated with grass. No major scarps sloughs, bulging, cracks, depressions, or other indications of slope instability or signs of seepage were observed. Figure 5.2.3-6 shows a representative section of the embankment.

Figure 5.2.3-6

5.2.4 Abutments and Groin Areas

Neither erosion nor uncontrolled seepage was observed along groins or abutments. Groin slopes and abutments are protected with the same vegetative cover as the adjoining slopes. Figures 5.2.4-1 shows typical conditions observed at the northwestern abutment between the Upper and Lower AQC Ponds.

Figure 5.2.4-1

5.3 OUTLET STRUCTURES

5.3.1 Overflow Structure/ Emergency Spillway

The Upper AQC Pond overflow structure is located at the center of southern embankment. The spillway consists of a 50-ft wide riprap lined channel over the embankment crest and the downstream slope. The opening for the spillway is shown to be 3 feet lower than the top of the embankment. The spillway design includes a 4-ft deep, 1-ft wide seepage cut off wall constructed at the inside crest of the embankment. The overflow drains directly into the La Cygne Generating Station cooling water lake. The structure appears to not have been used in recent history. Figure 5.3.1-1 shows the primary spillway structure for the Upper AQC Pond.

Figure 5.3.1-1

The Lower AQC Pond overflow structure is located at the northern quarter of the western embankment. The spillway consists of an 8' x 15' box reinforced concrete structure. The overflow drains directly into the La Cygne Generating Station cooling water lake. The structure appears to not have been used in recent history. However, some seepage was observed coming out of the box. Figure 5.3.1-2 shows the primary spillway structure for the Lower AQC Pond.

Figure 5.3.1-2

5.3.2 Outlet Conduit

<u>Upper AQC Pond</u>

The principal outlet for the Upper AQC Pond consists of a 6 ft wide by 9 ft long by 22 ft high concrete riser fitted with stop logs (see Appendix C: POND DRAWINGS). As the solids and water level in the pond increase over time, stop logs are added or removed to manage water levels within the impoundment.

The concrete riser is connected to a 260 ft long, 30-inch diameter corrugated metal pipe (CMP) that discharges into a basin at the toe of the embankment. The basin discharges into the lower AQC pond. The plans show that three anti-seep collars are present along the alignment of the CMP. The collars are cast-in-place concrete and are shown to be 8 ft high by 12 ft wide and 9 to 11 inches thick.

FINAL

Figures 5.3.2-1 and 5.3.2-2 shows the primary outlet structure for the Upper AQC Pond.

Figure 5.3.2-1

Figure 5.3.2-2

FINAL

Lower AQC Pond

The principal outlet for the Lower AQC Pond consists an intake pump structure. The pumps transport process water to the Upper AQC pond or to the power plant. They are the primary control of reservoir levels in the Lower AQC pond. Figure 5.3.2-3 shows the pump structure for the Lower AQC Pond.

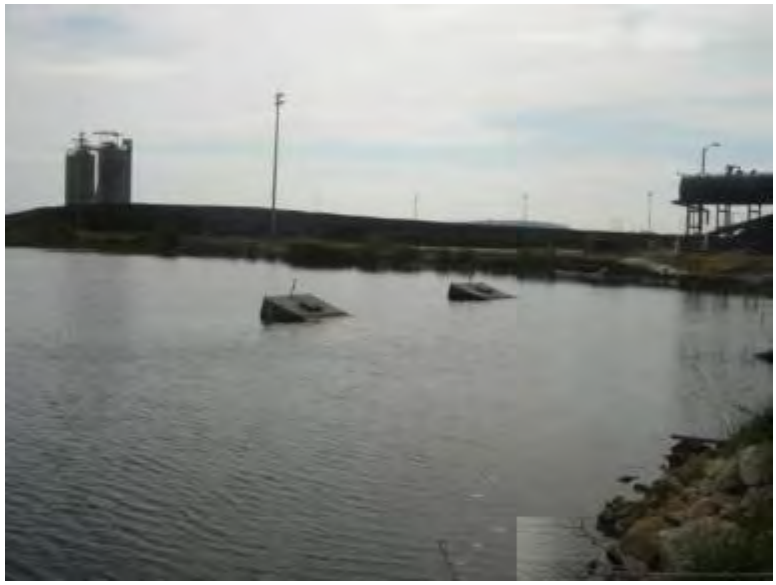


Figure 5.3.2-2

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Flood of Record/Safe Water Operating Level

KCP&L contracted with URS Corporation (URS) to conduct a Safe Water Level Study of the Upper AQC Pond (Appendix A: Doc 9). URS analyzed the safe operating water levels within the Upper AQC Pond. The objective was to keep water levels at or below a safe level to allow for the pond to store runoff and precipitation from the design storm and maintain a freeboard of one foot.

URS used the U.S. Army Corps of Engineers HEC-HMS computer software to calculate the peak discharges and total volume of captured stormwater for each basin. A 25-year, 24-hour design storm of 6.5 inches of total precipitation was used in the model. The U.S. Department of Agriculture's TR-55 was used in determining the precipitation amount for Linn County, Kansas. The study reported the following:

Total Site Storage Requirements	**124.35 ac-ft.**
From Stage Storage Table for Combined	**884.93 feet**
Recommended Safe Water Elevation	**884.5 feet**

Based on the calculations provided in the hydrologic and hydraulic study (See Appendix A – Doc's 1, 3, 9, and 10) the AQC Pond system can retain the probable maximum flood from a 25-year, 24-hour design storm event with a freeboard safety of at least 1.0 feet. Hence dike failure by overtopping seems unlikely.

6.1.2 Spillway Rating

The Lower AQC Pond spillway was designed with respect to EPA regulations at the time applicable to owners and operators of hazardous waste facilities (EPA, 1978). These proposed rules indicated that diversion structures should be capable of diverting the 25-year runoff away from the disposal site. Given these parameters the design capacity was approximately 785 cfs.

There were limited supporting documents to rate the Upper AQC Pond spillway. A Woodward Clyde Consultants letter to Kansas State Board of Agriculture Division of Water Resources dated 24 January 1979, indicated the riprap on the face of the Emergency Spillway was designed to resist fluid velocity of 12 feet per second which corresponds to approximately the flow during the probable maximum flood from a 25-year, 24-hour design storm.

6.1.3 Downstream Flood Analysis

The Final Geotechnical Evaluation for the La Cygne Generating Station AQC Ponds dated September 2010 and prepared by URS Corporation contained a Breach Impact Analyses that reported information pertaining to a downstream flood analysis and impact. As stated by URS:

"Both AQC ponds are located uphill and adjacent to Lake La Cygne, so materials (water and solids) released from the ponds in the event of a breach or failure of the pond embankments would enter the lake. ... Of interest is whether such a rapid release from the AQC ponds could cause Lake La Cygne dam to overtop.

The design drawings for Lake La Cygne were prepared by Black and Veatch and were provided to URS by KCP&L. The plans show that the lake discharges through an 88-foot-wide concrete ogee spillway with 2 radial gates that are 44 feet wide and 23 feet high. The crest and top of gate elevations are shown at 820.5 feet and 842 feet, respectively. ... The hydrologic data sheet shows that the dam is designed to store runoff from a maximum precipitation event of 28.72 inches over a 24-hour period. The hydrographs ... show that the lake level at the dam rises to a maximum of 847.1 feet during the design storm event. Top of dam elevation is 854 feet, so there would be approximately 7 feet of freeboard during the peak of the design storm.

A conservative estimate of the impact of breach or failure of the AQC ponds was made by assuming that the ponds failed during the peak of the hydrograph from the design storm event when the lake level at the dam would be 847.1 feet. The stage-storage curve included on the hydrologic data sheet shows the lake stores 60,000 acre-feet at elevation 847.1. It was also assumed that the entire volume contained within the ponds would be released into the lake. This is also a conservative assumption since the *ponds are partially filled with solids and many of the solids would remain within the pond footprint."*

Therefore, Dewberry was able to make the determination that if a catastrophic failure were to happen each AQC Pond would overflow into the La Cygne Generating Station cooling water lake. This structure has adequate capacity to absorb the release from a catastrophic failure.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

KCP&L provided numerous reports and documents documenting the La Cygne management units and the KCP&L Hydrologic/Hydraulic Safety. The information provided was accurate, however, each pond was studied at different times in the past and analyzed as a separate system operating independently. There is no study of how the whole system would function and operate as currently configured.

FINAL

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

The 12 January 1979, Woodward Clyde Consultants' memorandum titled, "Slope Stability And Hydrologic Design Bases For New FGD Sludge Retention Dam La Cygne Station, Kansas," (See Appendix A – Doc 10) includes the original stability analysis for the Upper AQC Pond.

The stability analyses included the following results:

- Dam embankment was designed to have a minimum factor of safety for static slope stability of 1.5 which is consistent with the recommendations contained in the, "Engineering and Design Manual for Coal Refuse Disposal Facilities," published by the U. S. Department of Interior, Mining Enforcement and Safety Administration (HESA).
- Critical section for the slope stability analysis is a 40 ft high dam embankment section with 2' horizontal to 1' vertical side slopes and steady state seepage from a reservoir 5 feet below the crest to a 20-foot wide drain located inside the dam on natural ground.
- Using effective stress shear strength parameters for the embankment material of 20 degrees for the angle of internal friction and 2 psi for the cohesion, Woodward Clyde Consultants' computed a factor of safety in excess of 1.6.
- Earthquake stability for the dam was investigated by applying a pseudo static horizontal seismic acceleration to the embankment which is consistent with the location of the dam in Seismic Risk Zone I (Algermlssen. 1969).
- Computed factor of safety for the previous critical dam section subjected to seismic loading was in excess of 1.4 which is consistent with a recommended minimum factor of safety of 1.2 for seismic loading according to the MESA publication.

Based on the results of the analyses it was concluded that the embankments have stability safety factors at or above the minimum recommended values.

7.1.2 Design Parameters and Dam Materials

The September 2010, URS Corporation of Overland Park, Kansas study entitled, "Final Geotechnical Evaluation for the La Cygne Generating Station AQC Ponds," (See Appendix A – Doc 1) includes the analysis of the existing dam materials.

Lower AQC Pond

Generalized graphical logs of the exploratory borings drilled for the Lower AQC pond are shown in the Final Geotechnical Evaluation for the La Cygne Generating Station AQC Ponds - Figure 5, (See Appendix A – Doc 1). The design plans for the Lower AQC pond show a homogeneous embankment. Generally, native residual soils composed of stiff, high plastic clays are present beneath the embankment. The fill encountered in the borings for the Lower AQC pond consist primarily of stiff, high plastic clay with minor, small rock fragments. The range of properties measured on samples tested is listed below:

Dry Density	93.9 to 104.8 pcf
Natural Water Content	22.5 to 29.5 percent
Liquid Limit	61 to 75 percent
Plastic Limit	46 to 57 percent
Unconfined compressive Strength	4.5 to 4.8 kips per square foot (ksf)

UPPER AQC POND

Generalized graphical logs of the exploratory borings drilled for the Upper AQC pond investigation are shown in the Final Geotechnical Evaluation for the La Cygne Generating Station AQC Ponds - Figure 6, (See Appendix A – Doc 1). The typical subsurface profile at the boring locations consists of embankment fill, residual soil, weathered bedrock, and bedrock.

Embankment fill shown in the design plans for the Upper AQC pond indicate that the embankment is zoned. Impervious fill was placed in the upstream slope and random fill was placed in the downstream slope.

Several exploratory borings encountered the impervious fill and the test pits encountered the random fill. The impervious embankment fill zone materials at the boring locations consist primarily of high plastic clays with small, weathered shale fragments. The range of properties measured on samples tested is listed below:

Dry Density	93.5 to 113.6 pcf
Natural Water Content	15.2 to 28.4 %
Liquid Limit	47 to 71 %
Plastic Limit	14 to 23 %
Unconfined compressive Strength	2.7 to 9.7 ksf

7.1.3 Uplift and/or Phreatic Surface Assumptions

The Geotechnical Evaluation for the La Cygne Generating Station AQC Ponds (See Appendix A – Doc 1) states that the design plans for the lower pond show no internal drainage was installed; consequently, the theoretical phreatic surface exits on the downstream slope of the embankment above the toe of the slope. Water levels at piezometers installed were are at or below the contact between the embankment and original ground surface; thus, well below the theoretical phreatic surface. It is reported that these measurements are consistent with the dry conditions observed at the toe of the slope. Also, if the phreatic surface was present on the downstream slope, then softened, wetted soils and hydrophilic vegetation would be expected. None of these conditions were observed. No conditions indicative of seepage through the embankment were observed along the downstream slope.

Based on the URS field observations of the Upper AQC Pond, test data and observed water levels, seepage through the embankment is not a significant concern for the AQC pond. Continued monitoring of water levels in the piezometers and periodic inspection of the downstream slope was recommended to document continued performance of the internal drainage system.

7.1.4 Factors of Safety and Base Stresses

In the September 2010 Final Geotechnical Evaluation for the La Cygne Generating Station AQC Ponds (See Appendix A – Doc 1), stability analyses were conducted on four selected sections through the downstream slope of the Upper AQC pond and two sections through the Lower AQC pond.

The calculated safety factors ranged from 1.50 to 1.94. It should be noted that the United States Army Corps of Engineers Engineering Manual EM 1110-2-1902, Slope Stability, recommends a minimum safety factor of 1.5 for steady seepage conditions. The reported safety factors for each section location meet this recommended minimum value.

7.1.5 Liquefaction Potential

No documentation of soil liquefaction analyses was provided to Dewberry for review.

7.1.6 Critical Geological Conditions

Earthquake stability for the dam was investigated by applying a pseudo static horizontal seismic acceleration to the embankment which is consistent with the location of the dam in Seismic Risk Zone I (Algermlssen. 1969). Computed factor of safety for the previous critical dam section subjected to seismic loading was in excess of 1.4 which is consistent with a recommended minimum factor of safety of 1.2 for seismic loading according to the MESA publication.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

The technical documentation provided to Dewberry provided a complete historical and current perspective of the structural stability of the AQC Ponds. The documentation did lack engineering analyses to assess the structural stability with respect to liquefaction potential.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Overall, the structural stability of the dams is **Satisfactory** based on the documents and studies provided.

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATING PROCEDURES

The Upper AQC pond was designed to act as a sedimentation basin which accepts and holds FGD sludge while maintaining a minimum amount of free surface water. FGD sludge consisting of water and suspended solids is introduced into the pond at the influent pipe location at a flow rate of approximately 5,000 gpm. The natural slope of the reservoir bottom causes the sludge to circulate from the northeast quadrant to the southwest quadrant of the reservoir. Along this route, the suspended solid particles drop out of suspension. The effluent is then decanted from the reservoir through the service spillway into the Lower AQC pond which serves as a surge pond for the new reservoir. The service spillway structure controls the outflow of effluent from the Upper AQC.

During rainfall events the water surface in the Upper AQC pond is designed to rise, letting more water discharge through the service spillway. The Upper AQC pond has a surface area which is approximately two to four times larger than the Lower AQC pond. Precipitation from the design storm would raise the water level approximately 2 ft in the Upper AQC pond and 6 feet in the Lower AQC Ponds. Operating water level must be raised by periodically adding stop logs to maintain the controlled circulation rate of approximately 5,000 gpm.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

A program of inspection and periodic maintenance has recently been initiated at La Cygne to maintain the structural integrity of the earth embankment. It was proposed that an in-depth inspection program be conducted by a KCP&L engineer at least once each year.

Based on observations made during the site visit, the crests of AQC Pond dikes were clear of vegetation. It is noted that the Upper AQC Pond had brushy vegetation, Saltceder: Tamarix Aphylla, purposely planted to enhance evapotranspiration. Other than the above noted, the dikes were generally free of trees and other large vegetation and appeared well maintained.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operating Procedures

Based on the above assessments, operating procedures appear to be adequate.

8.3.2 Adequacy of Maintenance

The current maintenance program appears to be adequate for the Ponds. However, several recommendations are suggested to improve maintenance and ensure a trouble free operation:

- Develop a regular written documentation log of the operations, inspection and maintenance program;
- Clear woody vegetation from the interior dike slope in the Upper AQC Pond

9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

The Stage 1 dam was instrumented with a series of eight settlement monuments along the dam crest. These monuments consisted of a steel rod anchored in concrete at a depth of from about 4 to 5 ft below the downstream crest of the dam. The portion of the rod above the concrete anchor was isolated from the soil and protected by free-floating PVC tubing. The purpose of the monuments was to provide an initial simple form of control for the dam at its highest section. The top of this steel rod was surveyed to determine its initial elevation and x and y coordinates. These monuments provide a basis for verifying the operating performance.

Exploratory drilling and piezometer installation activities were conducted from June 29, 2010 to July 9, 2010 by O'Malley Drilling Company under the direction of URS personnel (See Appendix A – Doc 1).

9.2 INSTRUMENTATION MONITORING

The following systems and instrumentation are present and functioning at La Cygne Generating Station:

- Eight settlement monuments along the dam crest (see Figure 9.2 -1)

Figure 9.2-1

FINAL

- Eleven Piezometers (see Figure 9.2 -2).

Figure 9.2-2

Although the systems, instrumentation and equipment are installed, there was not a set of regular monitoring procedures in place.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

Based on the data reviewed by Dewberry, including observations during the site visit, the inspection program is adequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

Although the current instrumentation systems installed appear to be adequate for the Ponds, it is recommended that KCP&L establish a regular monitoring and documentation program that logs and monitors changes in instrumentation readings on a recurring basis.

URS

September 17, 2010
URS Project 16530629

Mr. Mark Adams, P.E.
Kansas City Power & Light Company
One Kansas City Place
P. O. Box 418679
Kansas City, Missouri 64105

Re: Geotechnical Evaluation
AQC Ponds
La Cygne Generating Station

Dear Mr. Adams:

Transmitted with this letter is URS Corporation's report on our geotechnical evaluation of the AQC ponds at the referenced site. The scope of our evaluation included a breach analysis, seepage and slope stability analysis, settlement analysis, and installation of additional piezometers and settlement monitoring monuments.

We appreciate the opportunity to work with you on this project. If you have any questions concerning this report, please contact us.

Very truly yours,
URS Corporation

BRIAN D. LINNAN
LICENSED
10810
KANSAS
PROFESSIONAL ENGINEER

Brian D. Linnan, P.E.
Project Manager

Wayne D. Smith, P.E.
Senior Geotechnical Engineer

Enclosure

URS Corporation
8300 College Boulevard
Suite 200
Overland Park, KS 66210
Tel: 913.344.1000
Fax: 913.344.1011

GEOTECHNICAL EVALUATION

AQC PONDS – KANSAS CITY POWER & LIGHT

LA CYGNE GENERATING STATION
LA CYGNE, KANSAS

Prepared for
Kansas City Power & Light Company
P. O. Box 418679
Kansas City, Missouri

September 2010

URS Corporation
8300 College Boulevard
Suite 200
Overland Park, Kansas 66210

Project No. 16530629

TABLE OF CONTENTS

TABLE OF CONTENTS

Kansas City Power & Light's (KCP&L) La Cygne Generating Station has two impoundments containing waste materials from their air quality control systems at the station. These are referred to as air quality control (AQC) ponds, consisting of the Lower AQC pond and the Upper AQC pond. The pond locations are shown in Figure 1. The Lower AQC pond was constructed to receive flue gas desulphurization sludge sluiced from the power plant and was built as part of the original power plant construction. The design plans for this pond were prepared by Ebasco Services Incorporated and are dated in the early 1970s. Selected sheets showing design details are included in Attachment 1.

The Upper AQC pond was constructed in the late 1970s to provide additional storage for sluiced flue gas desulphurization sludge and is currently in service. The pond was designed by Woodward-Clyde Consultants (now URS); design plans are dated 1978. The original design plans for the pond are included in Attachment 2.

Currently, flue gas desulphurization sludge from the plant is sluiced to the Upper AQC pond. Overflow from the Upper AQC pond is directed to the Lower AQC pond through the upper pond's principal spillway. The ponds are managed as a non-discharge facility. Water levels are managed through enhanced evaporation and by drawing water from the Lower AQC pond for power plant operations.

Planned, future changes in power plant operations will eliminate the need to sluice flue gas desulphurization sludge to the existing AQC ponds; closure alternatives and schedules are under consideration by KCP&L for these existing AQC ponds. KCP&L contracted with URS to conduct a geotechnical evaluation of the existing AQC ponds to assess their performance and stability and to obtain data that will be useful in evaluating closure alternatives. The results of this evaluation are presented in this report.

Both the Upper and Lower AQC ponds are bounded by earth fill embankments which provide containment of the ash materials. The geotechnical evaluation included drilling exploratory borings, installing piezometers, conducting a video survey of the principal spillway conduit of the upper pond, and conducting laboratory tests on embankment and foundation soils. Additionally, J. D. Campbell, P.E., Ph.D., the engineer of record for the design and construction of the Upper AQC pond, provided technical assistance and served as an external peer reviewer of this report.

2.1 LOWER AQC POND

Plans prepared by Ebasco Services show that the lower pond is formed by an approximately 3,500-foot-long embankment. The plans do not provide details on the embankment materials, but given its limited height, we assume that the embankment is unzoned and consists entirely of compacted clay. No internal drainage is shown. An emergency overflow spillway is provided. Intake pumps for process water and pumps capable of delivering water to the Upper AQC pond or to the power plant are used as primary control of reservoir levels in the Lower AQC pond. The embankment for the Lower AQC pond was constructed as part of the original power plant construction. It was built in accordance with engineering plans and specifications and its construction was overseen by an independent construction manager. The embankments were constructed on ground undisturbed by power plant operations.

2.2 UPPER AQC POND

The Upper AQC pond is formed by an approximately 17,400-foot-long embankment. The design documents show that a typical embankment section has an impervious upstream section and a random zone on the downstream slope. The upstream and downstream slopes are inclined at 2.5H to 1V. The width of the dam crest varies with the height of the embankment, ranging from 13 feet where the embankment is shortest to 18 feet where the embankment is tallest. The height of the embankment varies from approximately 15 feet along the northwest side to about 45 feet on the southeast side.

The borrow materials for the embankment were obtained from within the reservoir. Borings drilled within the reservoir during the design investigation show that the general subsurface profile consisted of medium to high plastic residual clays over shale bedrock. The upper portion of the shale was weathered and plastic. With depth, the weathering decreased and the shale became harder and retained its laminated structure. The residual clays and weathered, plastic shale were excavated and used to construct the embankment. The embankment is zoned with an internal impervious zone, an external random zone, and a horizontal blanket drain near the downstream toe.

The embankment was designed and constructed with an internal drainage system to intercept seepage through the embankment. The drain was constructed of freely draining bottom ash with little fines and a gradation like a poorly graded medium to coarse sand. Internal drainage is provided along the entire length of the embankment (see Sheet 5, Attachment 2). Along the lower sections of the embankment, between stations 94+25 and about 174+00, the internal drainage system consists of a continuous 20- to 25-foot wide, 2-foot thick blanket drain that extends to the toe of the downstream slope. Along the higher portions of the embankment, a blanket drain begins approximately at the external limits of the base of the impervious zone; finger drains are provided to carry seepage to an outlet at the downstream embankment toe. The blanket drain from Station 0+00 to Station 94+25 is shown to be continuous along the length of the embankment and is approximately 15 to 20 feet wide and 3 feet thick. The finger drain outlets are 12 feet wide and 2 feet thick and are spaced on 200-foot centers. The drainage blanket material consists of coarse, pervious bottom ash generated at the station.

The principal spillway consists of an approximately 6 feet wide by 9 feet long by 22 feet high concrete riser fitted with stop logs (see Sheet 8, Attachment 2). As the solids and water level in the pond increased over time, stop logs were added or removed to manage water levels within the impoundment. The concrete riser is connected to an approximately 263-foot-long, 30-inch diameter corrugated metal pipe (CMP) that discharges into a basin at the toe of the embankment. The basin discharges into the lower AQC pond. The plans show that three anti-seep collars are present along the alignment of the CMP. The collars are cast-in-place concrete and are shown to be 8 feet high by 12 feet wide and 9 to 11 inches thick.

The emergency spillway consists of a 50-foot-wide riprap lined channel over the embankment crest and the downstream slope. The opening for the spillway is shown to be 3 feet lower than the top of the embankment. The spillway design includes a 4-foot-deep, 1-foot-wide, seepage cut off wall constructed at the inside crest of the embankment. The emergency spillway does not discharge into the Lower AQC pond, but rather discharges into a drainage swale that slopes to the west.

The Upper AQC pond was constructed from a signed and sealed set of construction drawings. The plans and specifications were submitted to the Kansas Division of Water Resources, State Board of Agriculture and were approved and stamped by Guy E. Gibson, P.E., the division's chief engineer. The pond embankments were constructed on ground that had not been impacted by power plant construction or operation. Geologic and geotechnical conditions at the site were extensively characterized. Over 100 exploratory borings or test pits were excavated and a thorough laboratory investigation was conducted to evaluate the properties of the soil and rock and in proposed embankment fills.

Woodward-Clyde Consultants provided construction management and quality assurance testing during construction of the Upper AQC pond under the direction of Dr. J.D. Campbell. The work included observation of stripping and other aspects of site preparation, observation and testing of the placement and compaction of the embankment fill, and observation of spillway construction.

2.3 HISTORIC PERFORMANCE

Following construction of the Upper and Lower ponds, KCP&L personnel performed periodic visual inspections of the embankments and their spillways. Historical observations on embankment performances were provided to URS for review. Additionally, URS has conducted annual groundwater monitoring at La Cygne since 2004 and has visited the site on many occasions since the facilities were constructed. Our previous observations include the crest of the embankment and toe of the downstream slope in the area of the existing monitoring wells.

The historical information provided by KCP&L and our past site observations indicate that embankments have been stable since construction with no indications of cracking, bulging or other indications of instability that might jeopardize the integrity of the ponds. Two separate shallow slides occurred on the downstream slope of the Upper AQC pond. The first slide occurred in 1987 and the second slide occurred in 1995. These slides were located approximately between Stations 50 and 58. On both occasions, the failure scarp was below the crest of the dam. Repairs implemented by KCP&L involved removal of the disturbed material and replacement with select imported fill and revegetation. Historic and recent inspections of the repaired areas indicate that repairs were effective.

3.1 SITE RECONNAISSANCE

A site reconnaissance was conducted on June 16 and 17, 2010 by Brian Linnan (June 16 only), Francke Walberg and Wayne Smith. Ms. Tiffany Wheeler of KCP&L accompanied URS inspection personnel on June 16. Mr. Mark Adams of KCP&L met with URS inspection personnel on June 17 to discuss previous inspection observations and maintenance activities. The scope of activities associated with the site reconnaissance included the following:

- Review of geotechnical borings and laboratory test data compiled by Woodward-Clyde Consultants (URS predecessor firm) during design of the Upper AQC pond.
- Review of design drawings for the Upper AQC pond prepared by Woodward-Clyde Consultants.
- Review of previous inspection reports prepared by Kansas City Power & Light (KCP&L) staff.
- Review of 2009 water level data obtained during the November 2009 annual groundwater sampling event.
- On-site discussions with Mark Adams concerning historical observations during past inspections.
- On-site discussions with Mark Adams and Kissick Construction (Russell Mohr) concerning historical observations and previous maintenance/repair activities.
- Site observations of the condition of the crest and downstream slope of both ponds with emphasis on the western perimeter of both ponds where embankments heights are greatest.
- Site observations concerning potential signs of seepage along the exterior embankment slope and toe of both ponds.
- Site observations concerning the locations of existing observation wells and survey monuments associated with the original construction and previous maintenance/repair activities.
- Site observations concerning the condition of the principal and emergency spillway of the Upper AQC pond and the outlet structure of the Lower AQC pond.

The observed condition of the embankments which form the two ponds was consistent with the findings presented in previous KCP&L inspection reports. The embankments remain stable and generally exhibit only minor signs of seepage at the toe of the slope, where the internal drains of the Upper AQC pond discharge. The embankments are generally well maintained and the existing vegetative growth has been effective in limiting long term erosion. Specific items of interest noted during the site reconnaissance are identified below:

- Historic Shallow Slope Failures: As noted in Section 2.3, the historical information indicates that there have been two shallow slides along the exterior slope of Upper AQC pond within the general area noted on Figure 2. The first shallow slide occurred during 1987 and the second shallow slide occurred in 1995. Reconstruction of the shallow slide areas included overexcavation and replacement of the slide materials with controlled fills with benching into the existing embankment materials. The general area of the previous slide repairs was observed during the 2010 site reconnaissance and no evidence of distress was noted. We were unable to discern the cause of the slides from our interviews with KCP&L and Kissick Construction, or the available records. It is Dr. Campbell's recollection that the sections of embankment between Stations 50 and 58 were some of the last sections constructed. Dr. Campbell also recalls that less plastic shale may have been placed in these sections of the embankment. It is possible that the sections of embankment completed last would have received a thicker topsoil cover, since there was an abundant supply available from stripping the embankment footprint and borrow areas. Although the cause of the slides is uncertain, the 14 plus years of good performance show that the repairs have been effective.

- Potential Seepage through the Upper AQC Embankment: The design and construction of the Upper AQC pond includes an internal drainage system to control seepage through the embankment and upper foundation. The internal drainage system includes a horizontal blanket drain extending to the toe along most of the eastern and southern perimeter of the embankment. The internal drainage system along the northern, western, and portions of the southern embankment includes an inner horizontal blanket drain with finger drains (spaced approximately 200 feet on-center) which daylight near the toe of the embankment. Site conditions during the reconnaissance were wet due to recent rainfall, but no signs of significant seepage through the embankment were noted. Several discrete areas of cattails and other changes in vegetation were observed which suggest localized seepage probably associated with the finger drains. Several large areas of cattails and marsh-like vegetation were also observed near the toe of the embankment. These areas appeared related to poor surface drainage rather than seepage through the embankment.
- Survey Monuments: There were eight settlement monuments (numbered SMC-1 through SMC-8) installed during the original construction activities for the Upper AQC pond. All eight monuments were identified during the site reconnaissance. The locations of these monuments are shown in Figure 3.
- Piezometers: Only one of the ten piezometers installed during the original Upper AQC pond construction activities (OW-5) was identified during the field reconnaissance. The location of OW-5 is shown in Figure 4.

3.2 EXPLORATORY DRILLING AND PIEZOMETER INSTALLATION

Eleven exploratory borings (P-501 through P-509 and P-601 through P-603) were advanced via 4.25-inch inner diameter (ID) Hollow Stem Augers (HSAs) from the crest of the embankments. The borings were extended through the embankment fills into the underlying bedrock foundation. Nine of the locations (P-501 through P-509) were drilled in the Upper AQC pond area and three of the locations (P-601 through P-603) were drilled in the Lower AQC pond area. The boring and piezometer locations are show on Figure 4. Each exploratory boring was sampled at five-foot-intervals with a California Sampler, Shelby Tube, or a split spoon sampler for geotechnical analysis, as well as descriptive logging. The exploratory boring logs are included in Appendix A.

Upon completion of the drilling and sampling, a piezometer was installed at each location. Piezometer installation reports are included in Appendix B. The exploratory drilling and piezometer installation activities were conducted from June 29, 2010 to July 9, 2010 by O'Malley Drilling Company under the direction of URS personnel.

3.3 TEST PITS

Eleven test pits (TP-501SS, TP-501T, TP-502T, TP-503SS, TP-504SS, TP-504T, TP-505SS, TP-505T, TP-506T, TP-507, TP-508T) were excavated in the Upper AQC pond area. The test pits with a "SS" designation were excavated in to the side slope of the embankment to observe and sample material in the random zone of the embankment. The test pits with a "T" designation were excavated into the toe of the embankment for the same purpose and to observe and sample the material associated with the internal drains. The locations of the test pits are shown on Figure 4. The test pits were excavated from July 14, 2010 through July 15, 2010 by Kissick Construction Company and were observed and documented by URS personnel.

Granular drainage material associated with the internal drainage system of the Upper pond was encountered in four of the test pits (TP-502T, TP-505T, TP-506T, and TP-507). The granular material is composed of black bottom ash. Water was observed flowing from the drainage material at each location it was encountered.

3.4 SETTLEMENT MONUMENTS

Nine new settlement monuments (SMC-9 through SMC-17) were installed at the site. The settlement monuments were constructed by drilling a boring to approximately three feet below ground surface with a 12-inch diameter auger. The bore hole was filled with concrete and a ½-inch diameter piece of steel rebar placed in the center. The rebar was cut so that approximately 2 inches is exposed above the top of the concrete. Six of the new settlement monuments (SMC-9 through SMC-14) were installed in the Upper AQC pond area and three of the new settlement monuments (SMC-15 through SMC-17) were installed in the Lower AQC pond area. The locations of the settlement monuments are shown on Figure 3. The settlement monuments were drilled and constructed from July 16, 2010 through July 20, 2010 by Kissick Construction Company.

3.5 SURVEYING

A horizontal and vertical survey of the existing and newly installed settlement monuments was performed at the site. In addition, ground surface elevations were measured at the test pit and piezometer locations and top of casing elevations were measured at the piezometers. The surveying was performed by Taliaferro and Browne, Inc., between July 19 and 22, 2010. The locations and elevations of the surveyed points are shown in Drawing 1.

3.6 VIDEO SURVEY

Ace Pipe, Inc., under subcontract to URS, conducted a video survey of the 30-inch diameter CMP principal spillway outlet associated with the Upper AQC pond. The video survey was conducted due to the age of the pipe, its importance to the structure's integrity and function, and because no record of assessments of the pipe since its installation were available. The video survey was conducted on August 20, 2010. The video survey indicated partial removal of a thin coating on the interior of the pipe attributable to water flowing through the pipe; however, it did not indicated areas of significant corrosion or defects in the pipe. A CD of the video survey is included as Attachment 3.

3.7 WATER LEVEL MEASUREMENTS

Water levels in the piezometers and nearby groundwater monitoring wells were measured using an electronic water level indicator on July 20, 2010. Water levels in the piezometers were measured again on August 20, 2010. The measurements are listed in Table 1.

All soil and bedrock samples collected in the exploratory borings and test pits were returned to the URS Overland Park, Kansas geotechnical testing laboratory for further visual examination. Selected samples were tested for water content, density, Atterberg Limits, unconfined compressive strength, and grain size. Data plots and a summary of the test results are included in Appendix C.

5.1 LOWER AQC POND

Generalized graphical logs of the exploratory borings drilled for the Lower AQC pond are shown in Figure 5. The design plans for the Lower AQC pond show a homogeneous embankment. The fill encountered in the borings for the Lower AQC pond consist primarily of stiff, high plastic clay with minor, small rock fragments. The range of properties measured on samples tested are listed below:

Dry Density	-	93.9 to 104.8 pcf
Natural Water Content	-	22.5 to 29.5 percent
Liquid Limit	-	61 to 75 percent
Plastic Limit	-	46 to 57 percent
Unconfined compressive Strength	-	4.5 to 4.8 kips per square foot (ksf)

Native residual soils composed of stiff, high plastic clays are present beneath the embankment at Borings P-601 and P-602. The liquid and plastic limits measured on a sample of the residual soil were 66 and 18 percent, respectively. An unconfined compressive strength of 2.2 kips per square foot was measured on the one sample tested. Boring P-602 terminated in residual clay at a depth of approximately 29 feet below ground surface.

Weathered shale was present beneath the residual clay in Boring P-601. The shale was encountered at a depth of 21.5 feet (elev. 841.9 ft.) and continued to the bottom of this 24.5-foot-deep boring.

5.2 UPPER AQC POND

Generalized graphical logs of the exploratory borings drilled for the Upper AQC pond investigation are shown on Figure 6. The typical subsurface profile at the boring locations consists of embankment fill, residual soil, weathered bedrock, and bedrock. The following sections summarize the properties of the subsurface materials encountered.

Embankment Fill – Sheet 7 of the design plans for the Upper AQC pond show that the embankment is zoned. Impervious fill was placed in the upstream slope and random fill was placed in the downstream slope. The exploratory borings P-501 through P-509 encountered the impervious fill and the test pits encountered the random fill.

The impervious embankment fill zone materials at the boring locations consist primarily of high plastic clays with small, weathered shale fragments. The range of properties measured on samples tested is listed below:

Dry Density	-	93.5 to 113.6 pcf
Natural Water Content	-	15.2 to 28.4 percent
Liquid Limit	-	47 to 71 percent
Plastic Limit	-	14 to 23 percent
Unconfined compressive Strength	-	2.7 to 9.7 ksf

Visual examination of the soil samples collected from the embankment and the water contents and densities measured are consistent with good compaction and high shear strength.

The random fill along the downstream slope of the embankment was sampled at the test pit locations. The material at the test pit locations consists of topsoil composed primarily of dark brown, high plastic clay with organics over high plastic clay with small shale and rock fragments. The thickness of the topsoil at the test pit locations ranged between 0.5 and 3 feet and was greater than 1.5 feet at 8 of the 11 test pit locations. The random fill appeared to be well compacted. Lifts were not discernable and no desiccation cracks or voids in the fill were observed. Measured water contents ranged between 10.9 and 28.7 percent. All but one of the seven samples tested had water contents of 24.6 percent or higher. Measured liquid limits ranged between 52 and 75 and measured plasticity indexes range between 32 and 54.

Gradation tests were conducted on samples of the embankment drain material collected at Test Pits TP-506T and TP-507. Gradation curves are included in Appendix C and show that the drain material classifies as poorly graded sand (SP) or poorly graded sand with silt (SP-SM) based on the Unified Soil Classification system. The percentage of fines, defined as amount of material passing the No. 200 sieve, ranged from 1.7 percent in the sample from TP-507 to 5.8 percent from the sample from TP-506T.

6.1 LOWER AQC POND

Figure 7 shows cross-sections through the exploratory borings drilled on the crest of the Lower AQC pond, water levels in the piezometers, the theoretical phreatic surface, and water levels measured in nearby groundwater monitoring wells. The design plans for the lower pond show that no internal drainage was installed; consequently, the theoretical phreatic surface exits on the downstream slope of the embankment above the toe of the slope. Water levels at Piezometers P-601 and P-602 are at or below the contact between the embankment and original ground surface; thus, well below the theoretical phreatic surface. These measurements are consistent with the dry conditions observations at the toe of the slope. If the phreatic surface was present on the downstream slope, then softened, wetted soils and hydrophilic vegetation would be expected. None of these conditions were observed.

A high water level does exist within the embankment at P-601. We believe this to be an anomalous condition caused by leakage adjacent to the pipes that feed the pump station near P-601. No conditions indicative of seepage through the embankment were observed along the downstream slope.

Based on our field observations and observed water levels, seepage through the embankment is not a significant concern for the Lower AQC pond embankment. However, continued monitoring of water levels in the piezometer and periodic visual inspection of the downstream embankment slope are recommended to confirm our assessment, particularly the anomalous condition identified at P-601.

6.2 UPPER AQC POND

The Upper AQC pond was constructed with a continuous internal drainage system. Refer to Sheets 5 and 7 of the Woodward-Clyde design (Attachment 2) for details on the drainage system.

Figures 8 through 11 show cross-sections of the Upper AQC pond embankment at the locations where the new piezometers, P-501 through P-509, were installed. Also shown on these cross-sections are the water levels in the piezometers and water levels interpolated from the groundwater monitoring wells adjacent to the pond. It is important to note that the piezometers and groundwater monitoring wells are measuring piezometric levels in different formations. The recently completed piezometers are screened in the embankment fill and/or the underlying residual soil and weathered shale. The groundwater monitoring wells are screened in the unweathered bedrock. Thus, water levels in the piezometers measure the influence of the water contained in the impondment and water levels in the groundwater monitoring wells are controlled by regional groundwater flow.

Soil mechanics literature contains equations and graphical methods to show the theoretical long-term, steady state phreatic surface within an embankment retaining water. The theatrical surfaces are included in Figures 8 through 11. A comparison between the measured water levels in the piezometers and the theoretical phreatic surface shows that, at all measured locations, the measured water levels in the embankment are below the theoretical phreatic surface. We postulate that the infiltration through the embankment is slow and limited and that the internal drainage system is functioning as intended.

The gradation of the bottom ash from the samples tested was compared to the criteria for filters published in United States Army Corps of Engineers Engineering Manual EM-1110-2-2300, General Design and Construction Considerations for Earth and Rick-Fill Dams. The gradation of the bottom ash samples tested met the permeability criteria but did not meet the filter criteria. Filtering prevents movement of finer soil particles from the embankment into and through the filter. While the existing drainage material does not meet the filter criteria, gradation tests on the bottom ash showed less than six percent fines. If movement of embankment fines was significant, we would expect that the fines content of the drainage material would be much higher than shown by the test results. Additionally, the plasticity and density of the impervious fill indicate low permeabilities which foster little or no migration of fines.

Based on our field observations, test data and observed water levels, seepage through the embankment is not a significant concern for the Upper AQC pond. Continued monitoring of water levels in the piezometers and periodic inspection of the downstream slope is recommended to document continued performance of the internal drainage system.

Stability analyses were conducted on four selected sections through the downstream slope of the Upper AQC pond and two sections through the Lower AQC pond. The locations of the sections analyzed and the rationale for their selection are listed below:

Location	Rationale for Selection
Piezometer P-502	Highest embankment section with blanket drain
Piezometer P-506	Highest section with toe drain
Piezometer P-507	Artesian condition in bedrock
Piezometer P-508	Representative of lower embankment heights along east side of pond
Piezometer P-601	Typical section of Lower AQC pond with measured, low water levels
Piezometer P-603	Measured high water level in Lower AQC embankment

The embankments have been in service for approximately 30 years; drained shear strength properties of the embankment and foundation materials are appropriate for the analyses. The shear strength properties for the native soils and weathered bedrock were developed using the results of laboratory tests conducted on samples from the borings and Wright's[1] published correlation between the fully-softened friction angle and liquid limit. The shear strength properties of the embankment soils were developed using the results of laboratory tests on embankment soils and embankment strengths developed by Duncan and Wright[2]. The shear strength envelope used for the embankment soils is illustrated in Figure 12.

The stability analyses assumed a fully developed theoretical phreatic surface within the embankment, a conservative assumption for observed current conditions since water levels are consistently below this theoretical level. The analyses were made using the UTEXAS3 software code.

The design plans for the Lower AQC pond show a top of embankment elevation of 864 feet and a maximum ash disposal elevation of 860 feet. For the purpose of drawing the theoretical phrectic surface for slope stability, a water level of 862 feet was assumed. The design plans for the Upper AQC pond show a normal maximum reservoir level of 885.8 feet and a top of embankment elevation of 890 feet. The normal maximum reservoir level was used to develop the phrectic surface for the slope stability analyses.

Calculated safety factors are listed in the following table. Graphical output from the stability program showing the embankment and foundation geometry, soil properties, piezometric levels, the critical slop surface, and calculated safety factors are included in Appendix D. Output from the stability program is also included in Appendix D.

[1] Wright, S.G. Evaluation of Soil Shear Strengths for Slope and Retaining Wall Stability Analyses with Emphasis on High Plasticity Clays, Report No. FHWA/TX-06/5-1874-01-1, 2005.

[2] Duncan, M.J. and Wright, S.G. Soil Strength and Slope Stability, John Wiley & Sons, Inc. 2005.

Summary of Computed Safety Factors - Downstream Embankment Slopes
La Cygne AQC Ponds

Section Location	Computed Safety Factor - Steady State Seepage Condition
P-502	1.52
P-506	1.50
P-507	1.58
P-508	1.60
P-601	1.94
P-603	1.55

The United States Army Corps of Engineers Engineering Manual EM 1110-2-1902, Slope Stability, recommends a minimum safety factor of 1.5 for steady seepage conditions. The computed safety factors for each section location meet this recommended minimum value.

Embankments constructed from high plastic clays can experience ‘wet weather’ slumps, and can be prone to slides if wet weather conditions develop after a prolonged period of dry weather when deep desiccation cracks may develop on the downstream slope. Strength reduction through wetting/drying related strains combined with water filled desiccation cracks may contribute to conditions where slides can occur. These slides are typically shallow and would not be expected to impact the stability of the embankment so long as repairs are made within a reasonable period.

The embankment materials and conditions at the time of the 1987 and 1995 shallow surface slides on the downstream slope of the Upper AQC pond are not sufficiently documented to explain the causes(s) of slope failure. The slides were shallow so they may have occurred as wet weather slumps due to the mechanism described above or they could have occurred due to a thickened topsoil covering and/or inadequate bonding between the topsoil and underlying embankment. Since these are the only slides that occurred over the past 30+ years and the repaired areas have been stable for over 15+ years, it is unlikely that shallow wet weather slides will develop in the future. We note that the test pits typically encountered 1 to 3 feet of topsoil on the downstream slopes. This thickness of topsoil may be effective in controlling desiccation cracks within the underlying plastic embankment fill.

Figure 3 shows the locations of the eight settlement monitoring monuments, SMC-1 through SMC-8 that were installed in 1980 at the time embankment construction was completed. Each of these monuments was found to be in place during the June 2010 site reconnaissance. The elevation of the monuments were measured in July 2010 by surveyors from Taliaferro and Browne. The original and July 2010 elevations at the monuments are listed below:

Measured Vertical Movements
at Original Settlement Monitoring Locations
Upper AQC Pond

Location	Reported As-Installed Monument Elev. (ft)	July 2010 Monument (ft))	Difference (ft)
SMC-1	890.67	889.63	-1.04
SMC-2	890.76	890.57	-0.19
SMC-3	891.11	891.08	-0.03
SMC-4	890.67	890.66	-0.01
SMC-5	890.86	890.91	+0.05
SMC-6	890.99	891.11	+0.12
SMC-7	891.49	890.46	-0.03
SMC-8	890.63	890.54	-0.09

Note: Negative numbers indicate settlement

A comparison between the original and July 2010 elevations shows that the embankment has settled less than 0.2 feet (approximately 2.5 inches) in 30 years at seven of the eight monuments. The settlement data at SMC-1 is attributed to damage of the monument.

The embankment is supported on stiff, over-consolidated residual clays and bedrock. Given these foundation conditions, most of the settlement would be expected to occur as the embankments were constructed; post-construction settlement would be small since the loads imposed are less than the pre-consolidation stress in the foundation materials. The measured performance of the embankment and nature of the embankment and foundation materials indicate that future embankment settlement will be negligible.

Both AQC ponds are located uphill and adjacent to Lake La Cygne, so materials (water and solids) released from the ponds in the event of a breach or failure of the pond embankments would enter the lake. The positions of the AQC pond and Lake La Cygne are shown in the figure included in Appendix E. Of interest is whether such a rapid release from the AQC ponds could cause Lake La Cygne dam to overtop.

The design drawings for Lake La Cygne were prepared by Black and Veatch and were provided to URS by KCP&L. The plans show that the lake discharges through an 88-foot-wide concrete ogee spillway with 2 radial gates that are 44 feet wide and 23 feet high. The crest and top of gate elevations are shown at 820.5 feet and 842 feet, respectively. Hydrologic data used for design of the dam are shown on Sheet D-202 of the design plans; this sheet is included in Appendix E.

The hydrologic data sheet shows that the dam is designed to store runoff from a maximum precipitation event of 28.72 inches over a 24-hour period. The hydrographs included on Sheet D-202 shows that the lake level at the dam rises to a maximum of 847.1 feet during the design storm event. Top of dam elevation is 854 feet, so there would be approximately 7 feet of freeboard during the peak of the design storm.

A conservative estimate of the impact of breach or failure of the AQC ponds was made by assuming that the ponds failed during the peak of the hydrograph from the design storm event when the lake level at the dam would be 847.1 feet. The stage-storage curve included on the hydrologic data sheet shows the lake stores 60,000 acre-feet at elevation 847.1. It was also assumed that the entire volume contained within the ponds would be released into the lake. This is also a conservative assumption since the ponds are partially filled with solids and many of the solids would remain within the pond footprint.

The table below shows the estimated volumes within the ponds, the calculated rise in lake level, and remaining freeboard.

Case	Estimated Volume Released (acre-ft)	Calculated Instantaneous Rise in Lake La Cygne Level		Top of Dam Elev.	Freeboard (ft)
		Feet	Lake Elev.		
Upper AQC Pond Breach	8,325	2.49	849.59	854	4.41
Lower AQC Pond Breach	2,294	0.68	847.8	854	6.22
Simultaneous Breach of Both Ponds	10,619	3.17	850.27	854	3.73

The calculations show that under worse case conditions, the freeboard on the dam be approximately 3.7 feet or greater; thus, the dam would not be overtopped.

We present the following conclusions based on the results of our investigation, analyses and experience with similar projects.

1. The embankments for the Upper and Lower AQC ponds are composed primarily of stiff, high plastic clays with small pieces of shale. Measured water contents and densities and visual examination of recovered samples and test pits are consistent with placement of fill in thin, well compacted lifts. The underlying foundation materials are stiff, overconsolidated, high plastic residual soils and bedrock.

2. Measurements of settlement monuments on the Upper AQC pond show that settlement since end of construction in 1980 is less than 2.5 inches. Additional settlement of the embankments is expected to be negligible. No measurements of settlement of the Lower AQC pond embankments are available, but these embankments are short compared to those for the Upper AQC pond. The embankments for the Lower AQC pond are also founded on stiff, overconsolidated soils and bedrock. Consequently, we expect that future settlement of the embankment for the Lower AQC pond will also be negligible.

3. The design of the Upper AQC pond included internal drains to control seepage. Test pits excavated for this investigation encountered the drains at the positions shown on the design drawings. Water was observed in the drains at each location where the drains were encountered. Comparisons between the water levels in the embankment measured in the newly installed piezometers and the theoretical phreatic surface consistently show water levels below the theoretical phreatic surface. We conclude that the internal drainage system is functioning as intended and is effectively controlling seepage.

   Design of the Lower AQC pond embankments did not include internal drainage. Measured water levels in the newly installed piezometers are at or below the contact between the embankment and original ground surface at two of the three piezometer locations. High water levels at P-603 appear to be attributable to seepage along intake pipes that penetrate the embankment near this location. Since the depth of water in the Lower AQC pond is small and the embankment consists of well compacted, high plastic clays, the potential for seepage through the embankment is limited. Consequently, it is unlikely that the embankments will be negatively impacted by seepage.

4. Our site reconnaissance of the embankments for both AQC ponds observed no indications of slope instability. Calculated slope stability safety factors for current conditions exceed 1.5, the minimum safety factor for steady seepage conditions recommended for dams by the United States Army Corps of Engineers.

   Embankments constructed of high plastic clays can experience shallow, wet weather slumps. Best available information suggests that the embankments for the upper and lower ponds have not experienced such slides, perhaps due to the topsoil covering which may be controlling desiccation cracks. The shallow slides in 1987 and 1995 appear to be attributable to other causes. There have been no other slides since the 1987 and 1995 slides were repaired.

5. A conservative analyses shows that a release of the entire volume of solids and water stored in the Upper and Lower AQC ponds would raise the water level in Lake La Cygne approximately 3.2 feet. Assuming the release occurred when the lake was as its maximum operating level, the remaining freeboard would be approximately 3.7 feet. The failure of the AQC ponds would not raise the lake water level enough to overtop Lake La Cygne dam.

6. The embankments for the Upper and Lower AQC ponds have performed well over their 30+ years of service. The conditions encountered by this investigation and our analyses indicate continued favorable performance may be expected over the long-term.

The conclusions and recommendations presented in this report are based on the assumption that significant variations in soil properties from those encountered by our investigation do not occur. Borings have been placed at planned, selected locations, but some variation in soil properties between the borings probably exists. If conditions are notably different from those described here are discovered, we should be immediately notified.

The conclusions and recommendations given in this report are based on our analysis of the data collected for this project. Additive conclusions or recommendations made from these data by others are their responsibility. Our assessment is based on observations of current conditions, We note that planned, periodic visual inspections of the dams are important to identify any changes from present conditions that may require data maintenance.

Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

Table 1
Water Level Data
AQC Pond Geotchnical Investigation
La Cygne Generating Station
La Cygne, Kansas

Piezometer or Monitoring Well Number	Top of Casing (ft)	Depth to Water (ft) 7/20/10	Groundwater Elevation (ft) 7/20/10	Depth to Water (ft) 8/20/10	Groundwater Elevation (ft) 8/20/10
MW-1	878.09	6.38	871.71	NM	NM
MW-2	880.75	10.01	870.74	NM	NM
MW-3	879.14	3.81	875.33	NM	NM
MW-4	882.65	5.49	877.16	NM	NM
MW-5	869.88	2.09	867.79	NM	NM
MW-6	859.37	8.22	851.15	NM	NM
MW-7	854.21	6.00	848.21	NM	NM
MW-8	854.10	2.95	851.15	NM	NM
MW-9	881.00	14.09	866.91	NM	NM
MW-10	873.78	0.78	873.00	NM	NM
MW-11	875.97	1.70	874.27	NM	NM
MW-12	877.55	7.32	870.23	NM	NM
MW-13	876.32	5.95	870.37	NM	NM
MW-14R	878.91	9.09	869.82	NM	NM
MW-15	873.24	8.44	864.80	NM	NM
MW-16	851.93	2.02	849.91	NM	NM
MW-17	852.31	5.80	846.51	NM	NM
PZ-1D*	882.59	5.59	877.00	NM	NM
PZ-1S*	881.90	DRY	DRY	NM	NM
PZ-2D*	882.72	5.74	876.98	NM	NM
PZ-2S*	882.79	24.42	858.37	NM	NM
TW-1*	861.88	18.65	843.23	NM	NM
TW-2 (8R)*	858.96	17.25	841.71	NM	NM
TW-3*	852.29	7.84	844.45	NM	NM
OW-5	891.81	38.57	853.24	38.76	853.05
P-501**	894.58	36.76	857.82	36.64	857.94
P-502**	891.69	39.71	851.98	39.07	852.62
P-503**	892.04	40.00	852.04	37.58	854.46
P-504**	891.56	45.99	845.57	39.85	851.71
P-505**	892.10	32.66	859.44	32.76	859.34
P-506**	892.56	17.78	874.78	18.48	874.08
P-507**	893.15	31.96	861.19	16.40	876.75
P-508**	892.42	24.08	868.34	21.91	870.51
P-509**	893.92	25.18	868.74	25.45	868.47
P-601**	865.60	DRY	DRY	13.82	851.78
P-602**	865.91	23.95	841.96	23.25	842.66
P-603**	864.99	5.48	859.51	4.81	860.18

Notes: NM = not measured

URS 8300 College Blvd., Suite 200 Overland Park, Kansas 66210

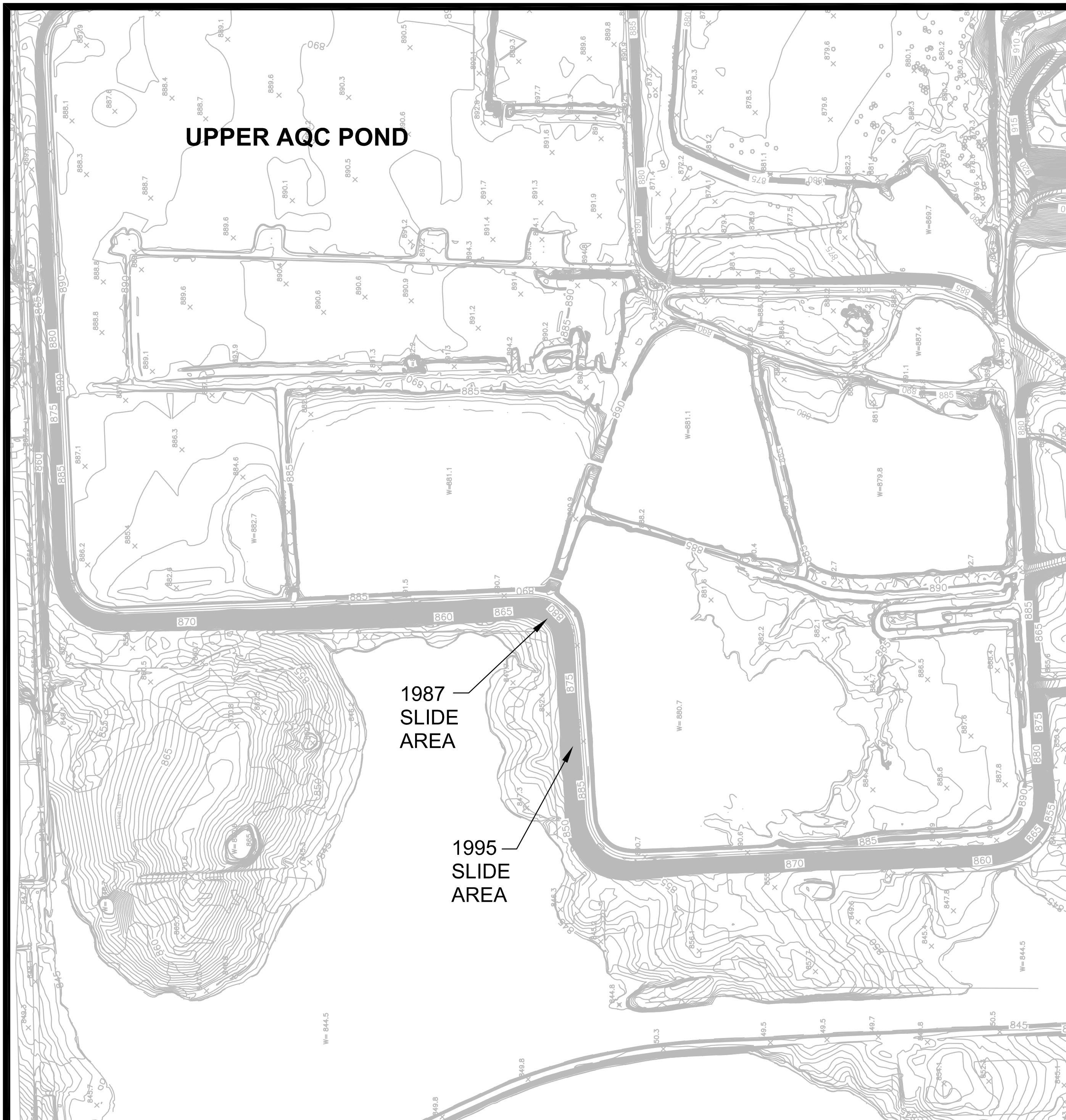
CLIENT: KANSAS CITY POWER & LIGHT COMPANY

LOCATION: LA CYGNE GENERATING STATION

TITLE: AQC POND LOCATIONS

DRAWN BY	CHECKED BY	APPROVED BY
TMS	WDS	BDL
PROJECT NO.	DATE	FIGURE NO.
16530629	SEPT. 2010	1

September 20, 2010 9:46:45 am (mlk)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Geotech Report AQC Pond Aerial.dwg



N

700 0 700

SCALE IN FEET

URS 8300 College Blvd., Suite 200
Overland Park, Kansas 66210

CLIENT: KANSAS CITY POWER & LIGHT COMPANY

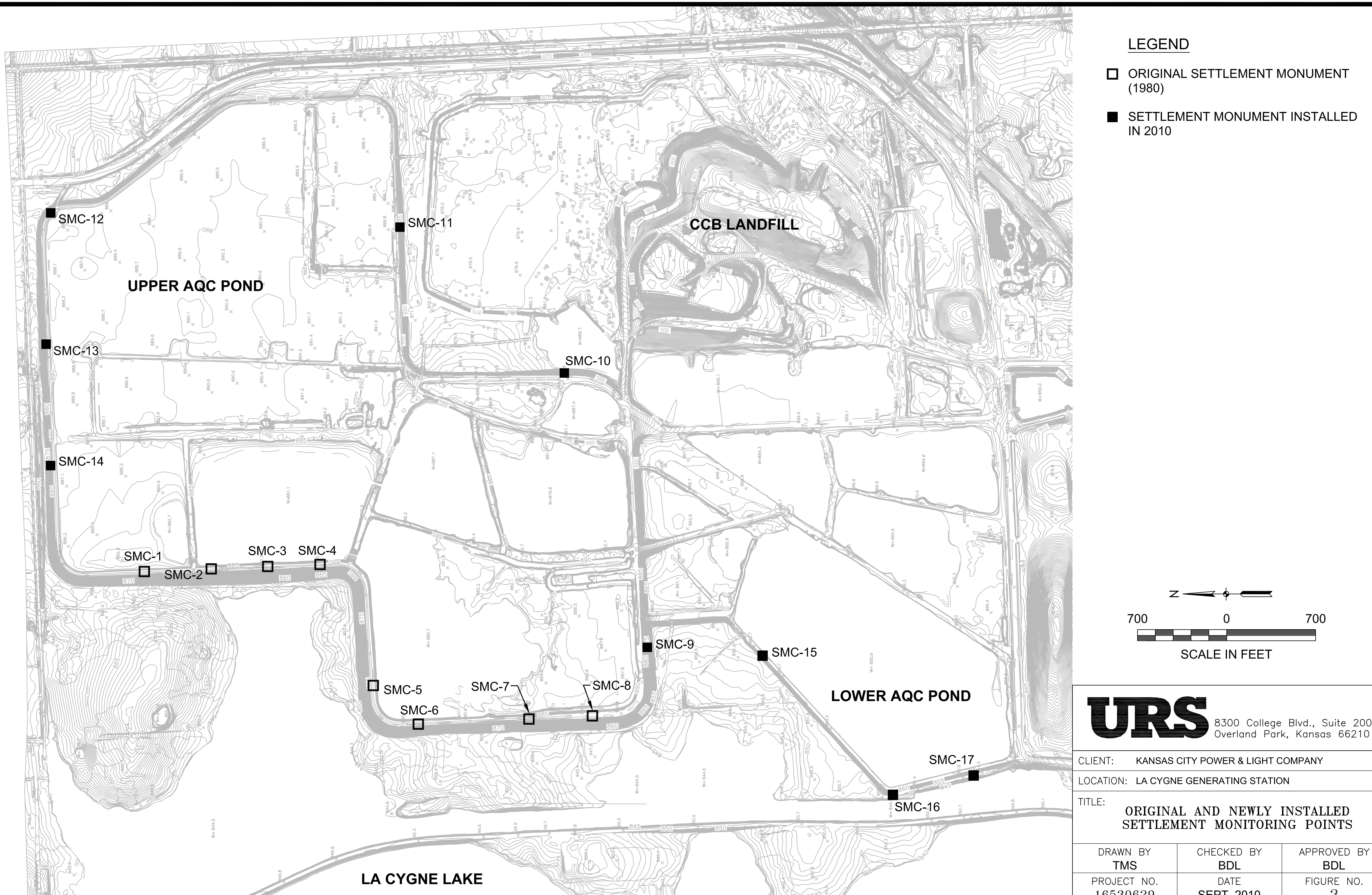
LOCATION: LA CYGNE GENERATING STATION

TITLE:

LOCATION OF 1987 AND 1995 SLIDES

DRAWN BY	CHECKED BY	APPROVED BY
TMS	BDL	BDL
PROJECT NO.	DATE	FIGURE NO.
16530629	SEPT. 2010	2

September 9, 2010 2:56.51 pm (mik)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Geotech Report Slide Location.dwg



URS
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

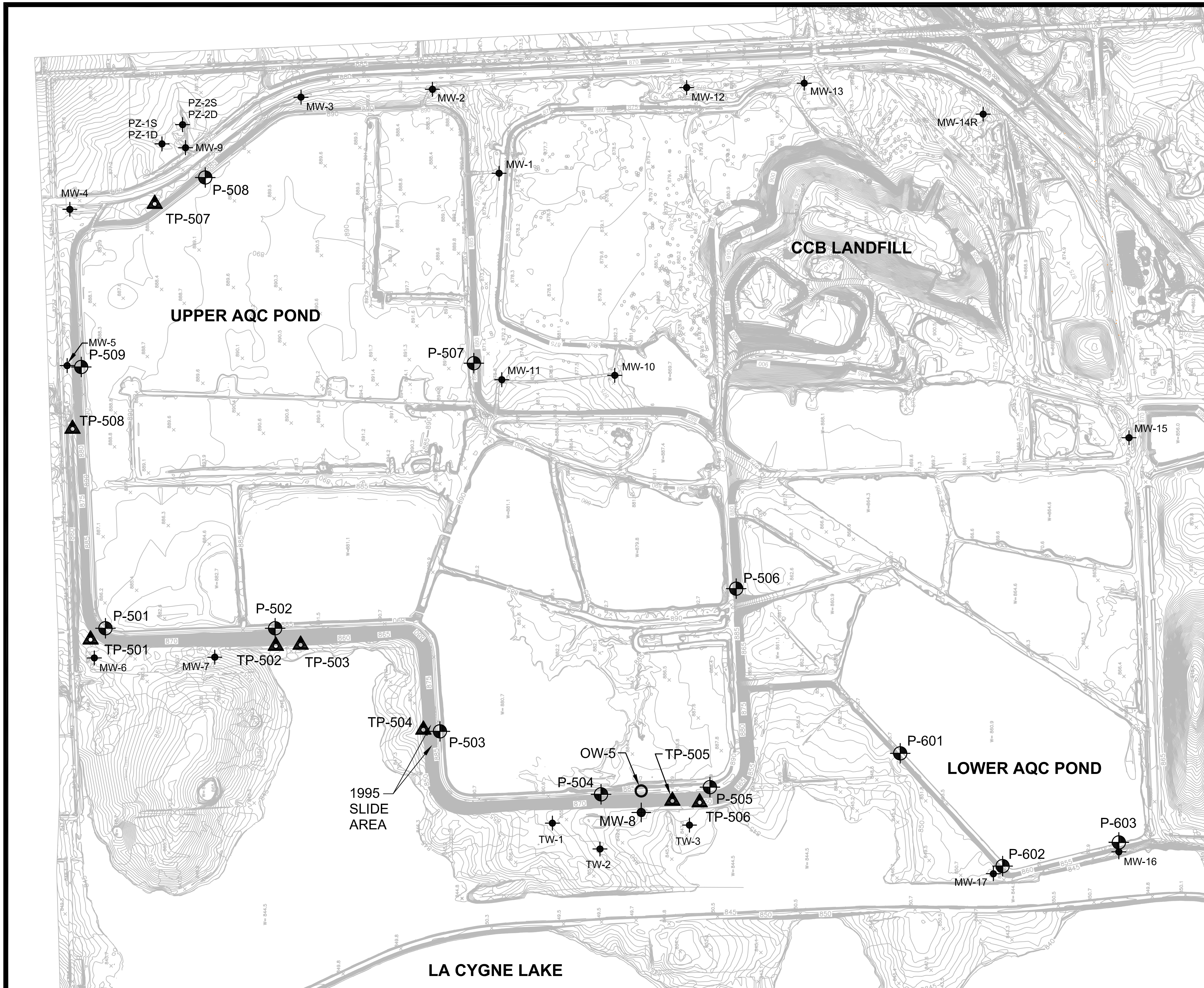
CLIENT: KANSAS CITY POWER & LIGHT COMPANY

LOCATION: LA CYGNE GENERATING STATION

TITLE: ORIGINAL AND NEWLY INSTALLED SETTLEMENT MONITORING POINTS

DRAWN BY	CHECKED BY	APPROVED BY
TMS	BDL	BDL
PROJECT NO.	DATE	FIGURE NO.
16530629	SEPT. 2010	3

September 9, 2010 2:59.38 pm (mik)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Geotech Report Monitoring Points.dwg



LEGEND

- PZ-1S, TW-1 — EXISTING PIEZOMETER LOCATION
- MW-6 — EXISTING GROUNDWATER MONITORING WELL LOCATION
- OW-5 — ORIGINAL PIEZOMETER FOUND TO BE SERVICEABLE DURING JUNE 2010 SITE RECONNAISSANCE
- P-501 — EXPLORATORY BORING AND PIEZOMETER LOCATION (2010)
- TP-501 — TEST PIT LOCATION (2010)

N

700 0 700

SCALE IN FEET

URS

8300 College Blvd., Suite 200
Overland Park, Kansas 66210

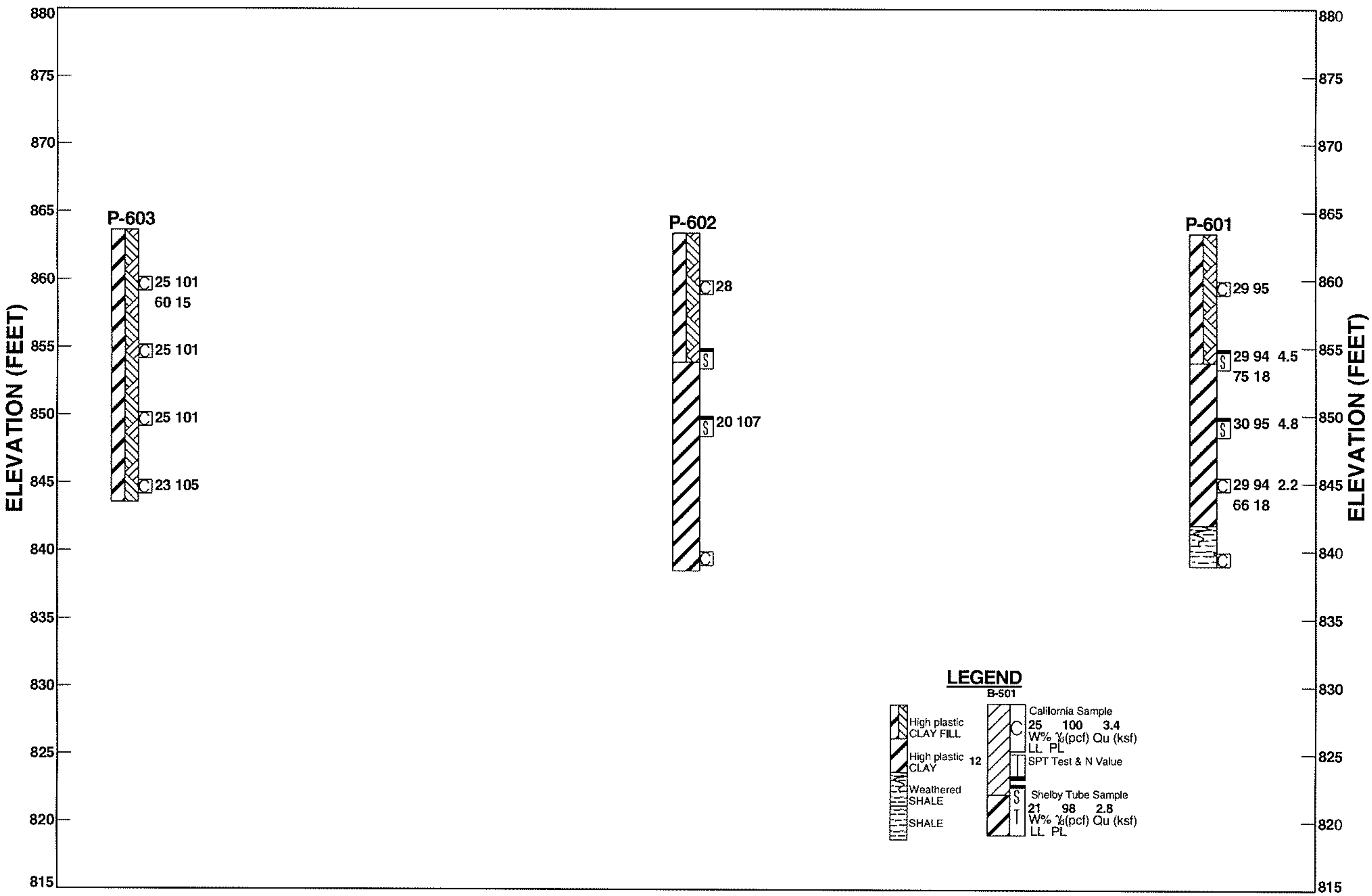
CLIENT: KANSAS CITY POWER & LIGHT COMPANY

LOCATION: LA CYGNE GENERATING STATION

TITLE: EXPLORATORY BORING, TEST PIT, AND PIEZOMETER LOCATIONS

DRAWN BY	CHECKED BY	APPROVED BY
TMS	BDL	BDL
PROJECT NO.	DATE	FIGURE NO.
16530629	SEPT. 2010	4

September 20, 2010 9:17:34 am (mlk)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Geotech Report Borings & Test Pits.dwg

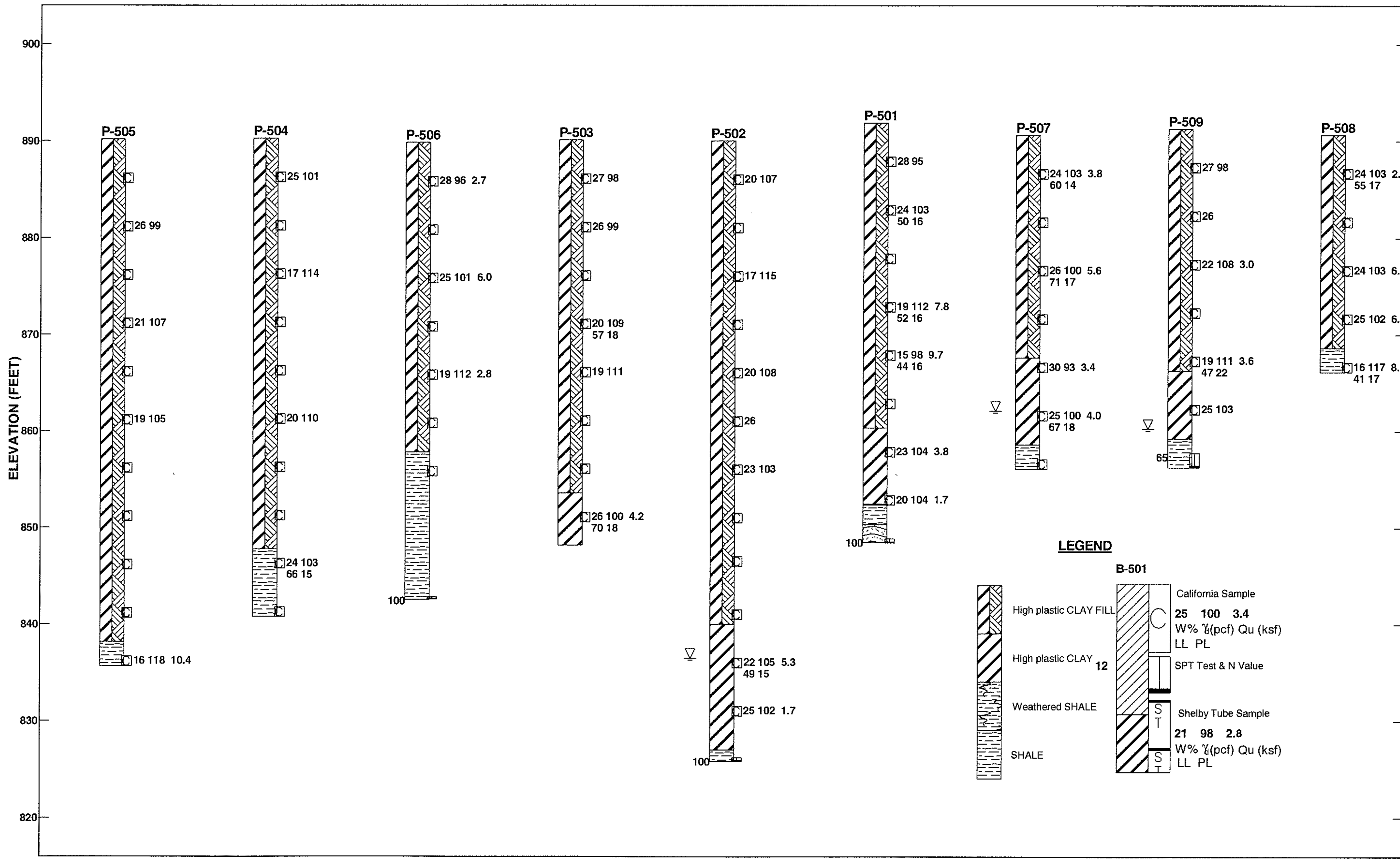


URS

8300 College Blvd. Suite 200
Overland Park, Kansas 66210
Tel:913-344-1000
Fax:913-344-1011

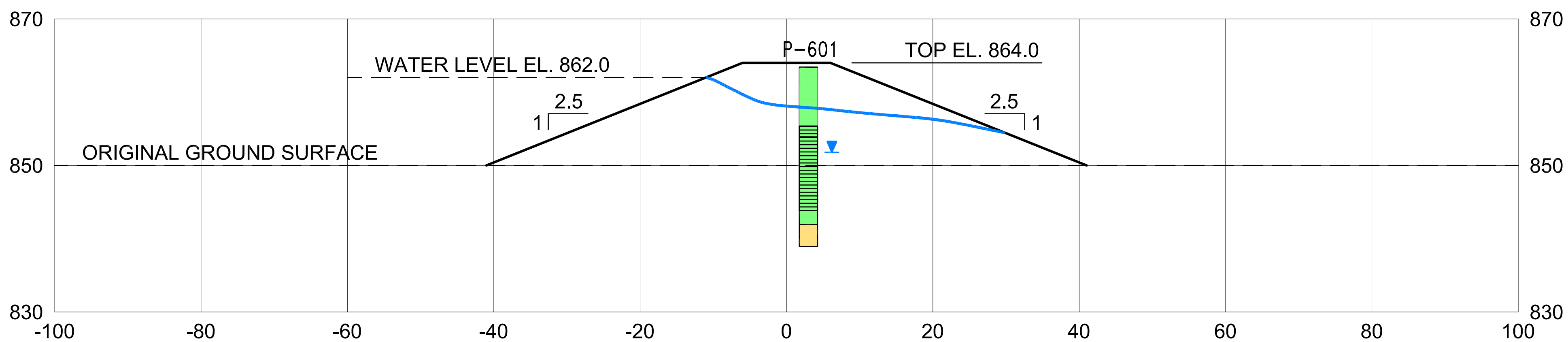
Generalized Graphical Boring Logs-Lower AQC Pond
KCP&L La Cygne Station
La Cygne, Kansas

Project Number	Date
16530629	9/1/2010
Checked By	Figure No.
BD	5

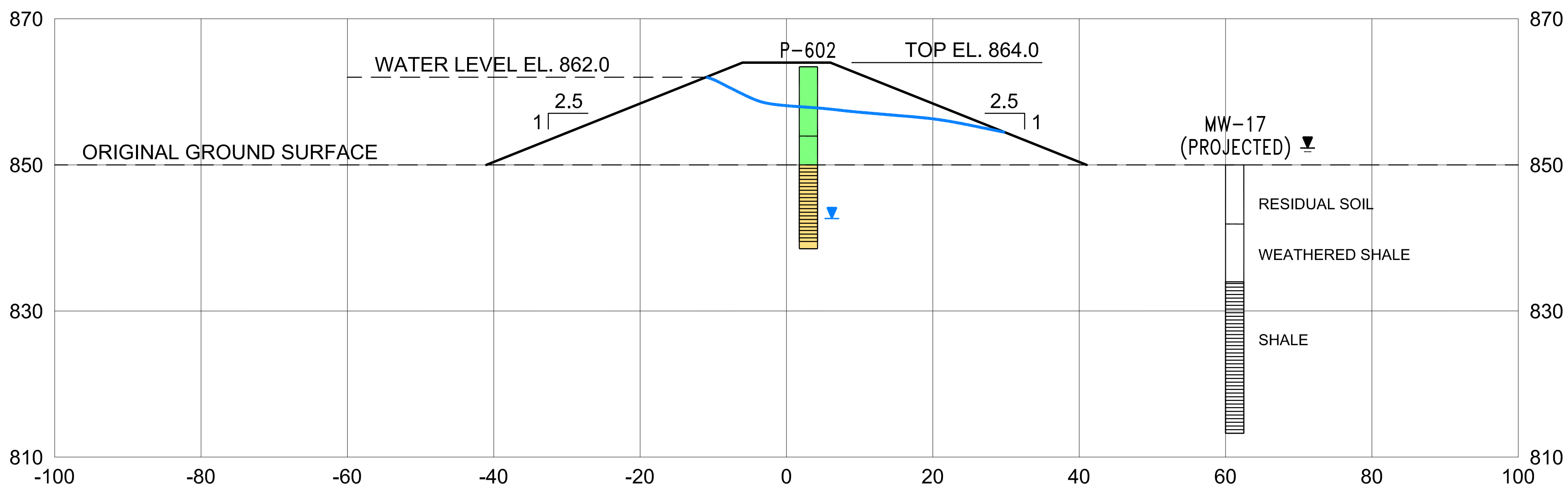


URS	8300 College Blvd, Suite 200 Overland Park, Kansas 66210 Tel: 913-344-1000 Fax: 913-344-1011	**Generalized Graphical Boring Logs-Upper AQC Pond** **KCP&L La Cygne Station** **La Cygne, Kansas**	Project Number 16530629	Date 9/1/2010
			Checked By BD	Figure No. 6

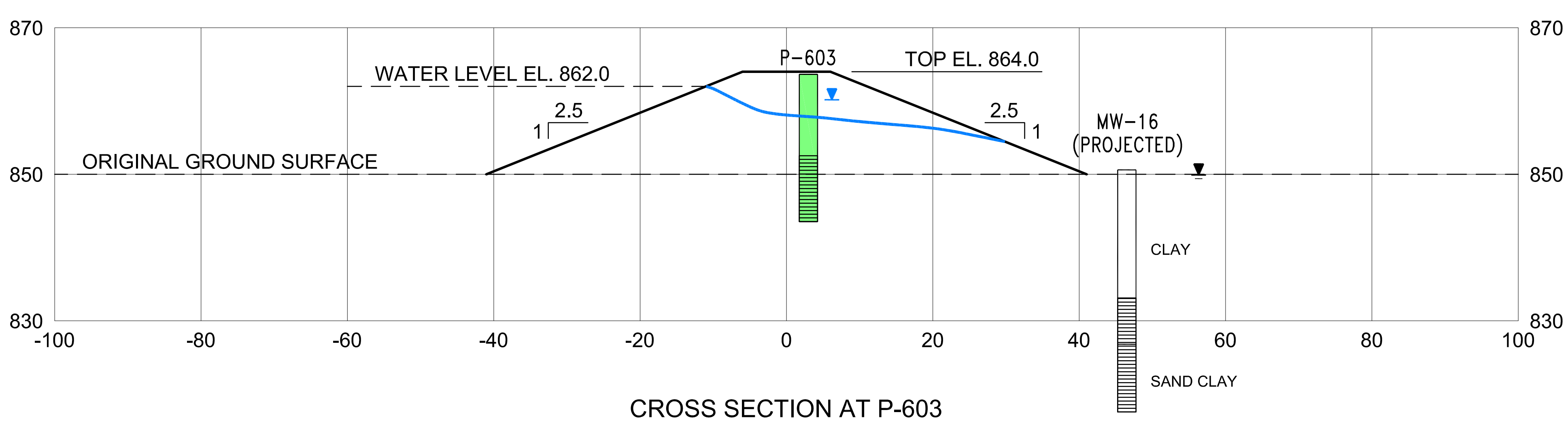
XSECT11X17 WITH SAMPLES AND SAMPLE DATA 16530629LACYGNE.GPJ OVP1.GDT 9/1/10



CROSS SECTION AT P-601



CROSS SECTION AT P-602



CROSS SECTION AT P-603

LEGEND

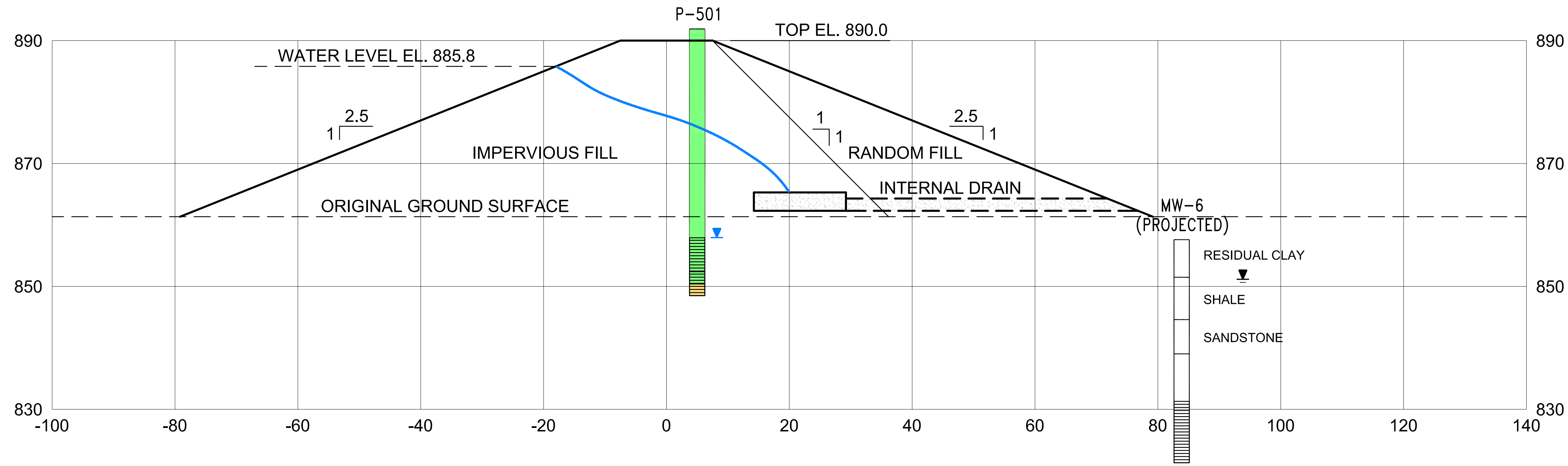
- THEORETICAL PHREATIC SURFACE
- WATER LEVEL IN PIEZOMETER JULY 20, 2010
- WATER LEVEL IN GROUNDWATER MONITORING WELL JULY 20, 2010
- EMBANKMENT FILL
- RESIDUAL SOIL OR SHALE
- SCREENED INTERVAL IN PIEZOMETER OR GROUNDWATER MONITORING WELL

NOTES

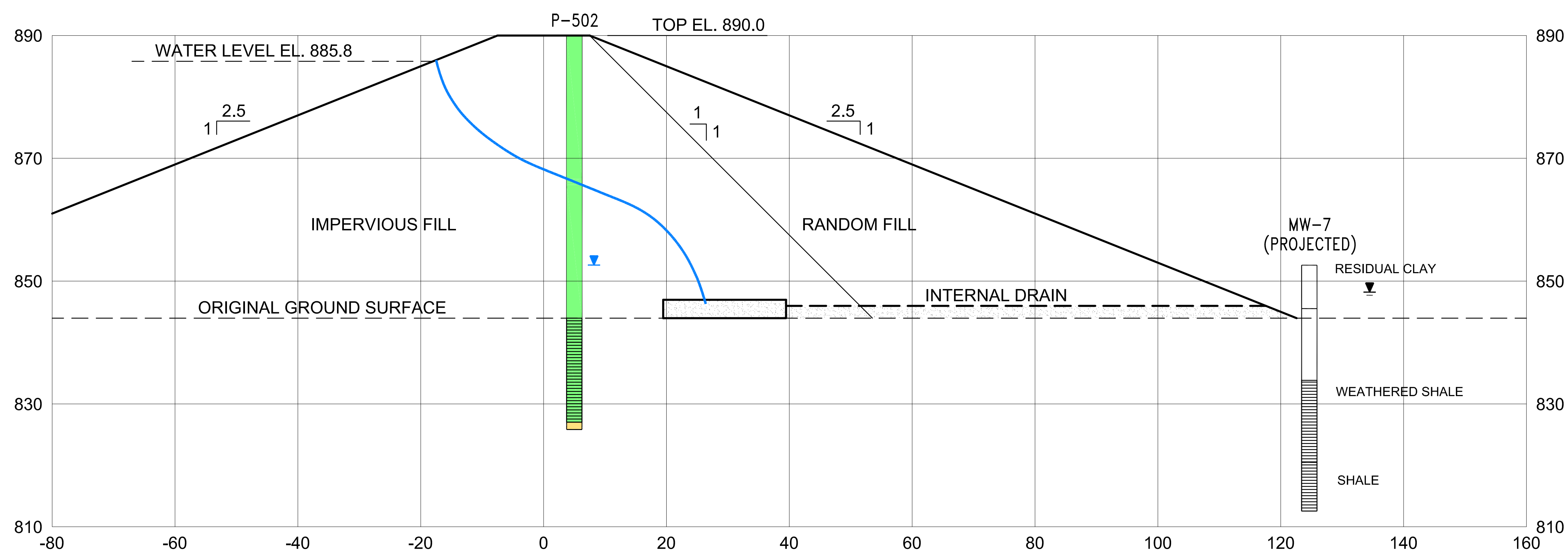
1. PIEZOMETERS P-601, P-602 AND P-603 WERE INSTALLED JULY 6 AND 7, 2010.
2. THE DESIGN PLANS SHOW A "MAX ASH DISPOSAL ELEVATION 860." THE WATER LEVEL IN THE POND IS ASSUMED TO BE 2 FEET HIGHER.

URS
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

CLIENT:	KANSAS CITY POWER & LIGHT COMPANY	
LOCATION:	LA CYGNE GENERATING STATION	
TITLE:	EMBANKMENT CROSS SECTION AT P-601, P-602, AND P-603	
DRAWN BY TMS	CHECKED BY BDL	APPROVED BY BDL
PROJECT NO. 16530629	DATE SEPT. 2010	FIGURE NO. 7



CROSS SECTION AT P-501



CROSS SECTION AT P-502

LEGEND

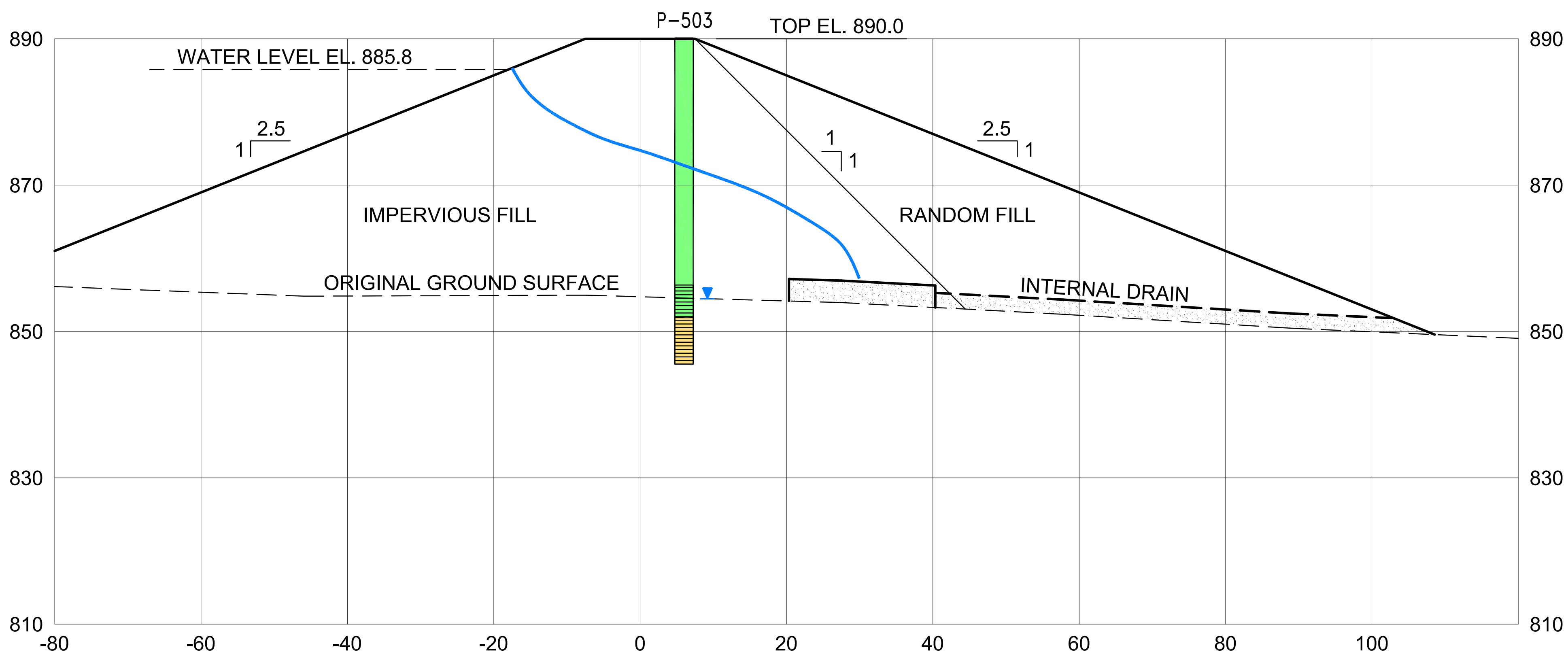
- THEORETICAL PHREATIC SURFACE
- WATER LEVEL IN PIEZOMETER AUGUST 20, 2010
- WATER LEVEL IN GROUNDWATER MONITORING WELL JULY 20, 2010
- EMBANKMENT FILL
- NATIVE MATERIALS
- SCREENED INTERVAL IN PIEZOMETER OR GROUNDWATER MONITORING WELL

NOTES

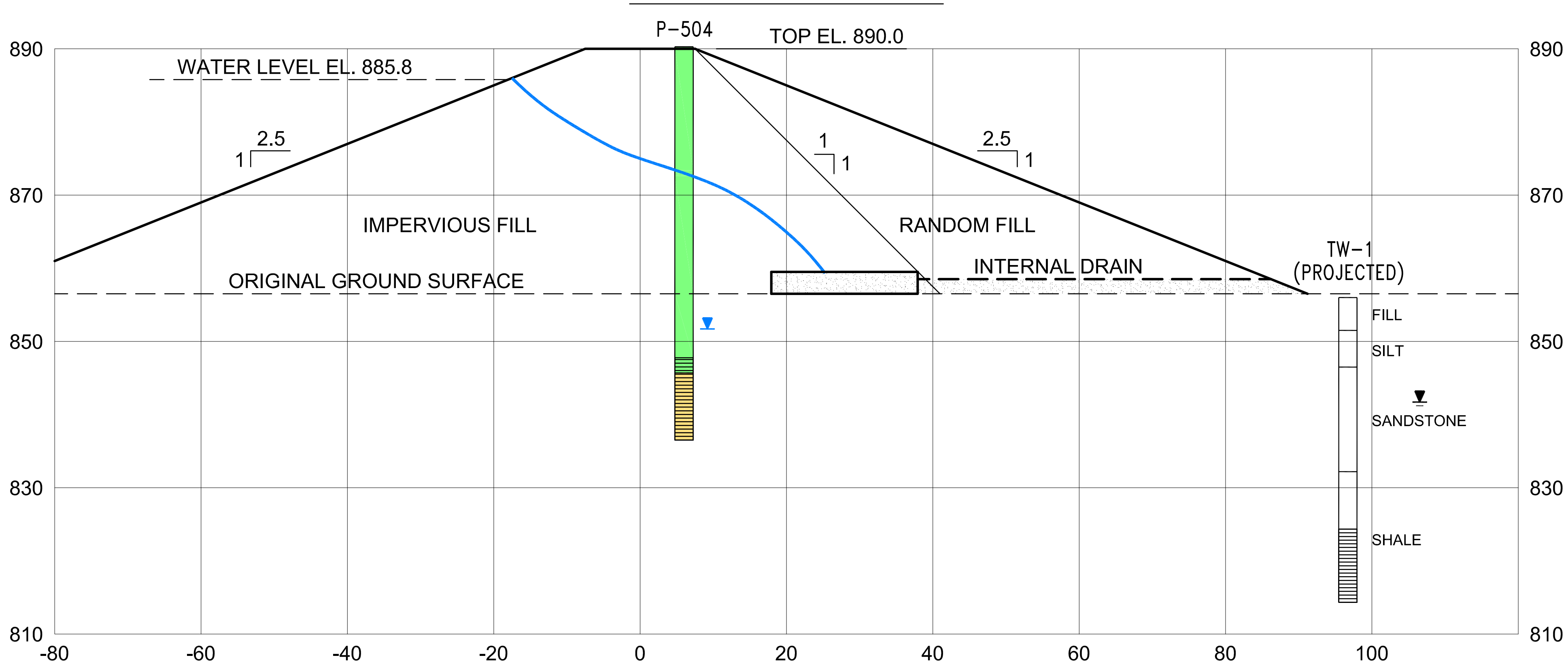
1. PIEZOMETERS P-501 AND P-502 WERE INSTALLED JULY 1, 2010.
2. THE IMPERIVOUS FILL AND RANDOM FILL ARE DRAWN AS SHOWN ON THE DESIGN PLANS.

URS
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

CLIENT: KANSAS CITY POWER & LIGHT COMPANY		
LOCATION: LA CYGNE GENERATING STATION		
TITLE: EMBANKMENT CROSS SECTION AT P-501 AND P-502		
DRAWN BY TMS	CHECKED BY BDL	APPROVED BY BDL
PROJECT NO. 16530629	DATE SEPT. 2010	FIGURE NO. 8



CROSS SECTION AT P-503



CROSS SECTION AT P-504

LEGEND

- THEORETICAL PHREATIC SURFACE
- WATER LEVEL IN PIEZOMETER AUGUST 20, 2010
- WATER LEVEL IN GROUNDWATER MONITORING WELL JULY 20, 2010
- EMBANKMENT FILL
- NATIVE MATERIALS
- SCREENED INTERVAL IN PIEZOMETER OR GROUNDWATER MONITORING WELL

NOTES

1. PIEZOMETERS P-503 AND P-504 WERE INSTALLED JUNE 30, 2010.
2. THE IMPERVIOUS FILL AND RANDOM FILL ARE DRAWN AS SHOWN ON THE DESIGN PLANS.

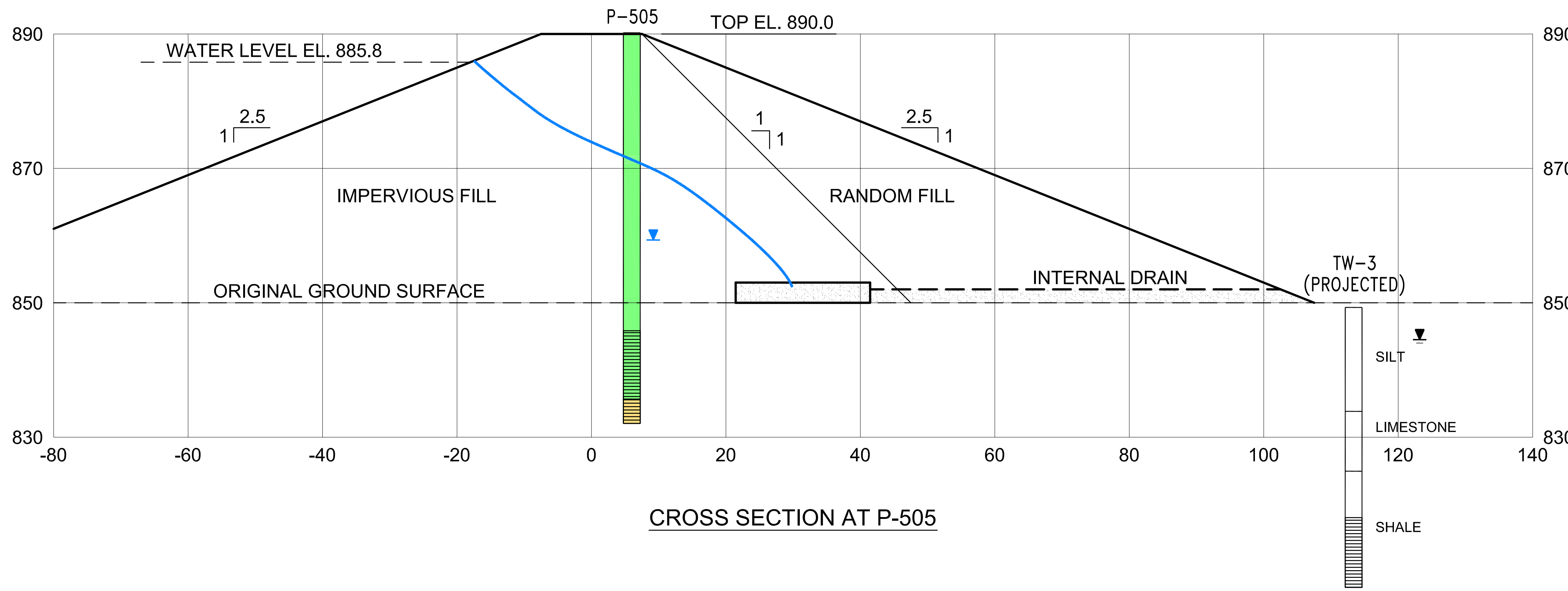
URS 8300 College Blvd., Suite 200 Overland Park, Kansas 66210

CLIENT: KANSAS CITY POWER & LIGHT COMPANY

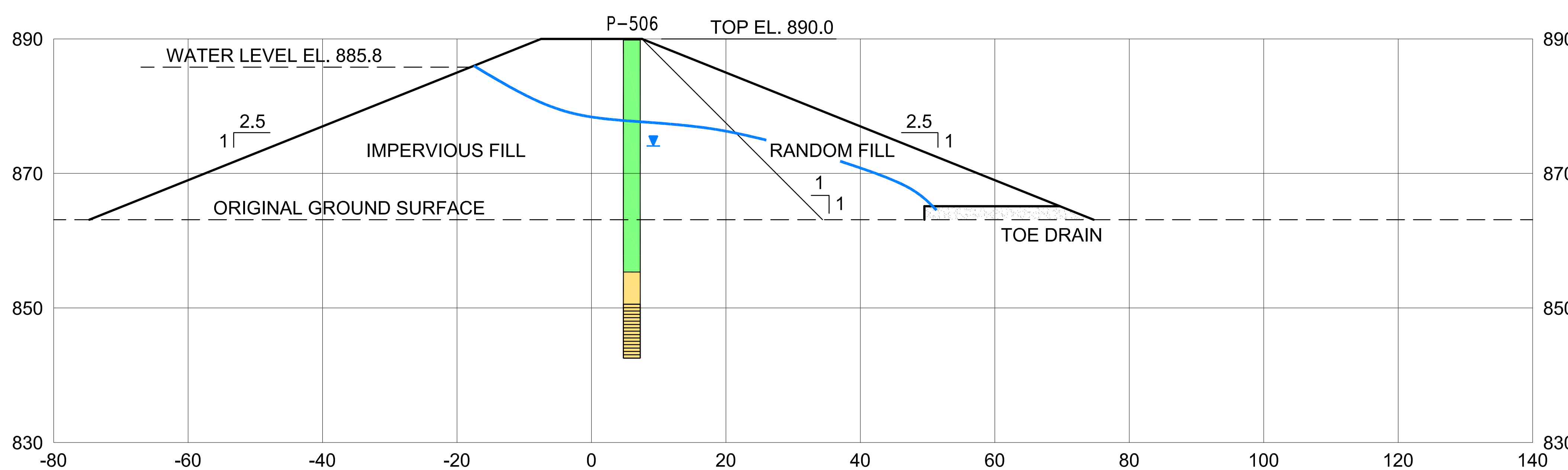
LOCATION: LA CYGNE GENERATING STATION

TITLE: EMBANKMENT CROSS SECTION AT P-503 AND P-504

DRAWN BY	CHECKED BY	APPROVED BY
TMS	BDL	BDL
PROJECT NO.	DATE	FIGURE NO.
16530629	SEPT. 2010	9



CROSS SECTION AT P-505



CROSS SECTION AT P-506

LEGEND

- THEORETICAL PHREATIC SURFACE
- WATER LEVEL IN PIEZOMETER AUGUST 20, 2010
- WATER LEVEL IN GROUNDWATER MONITORING WELL JULY 20, 2010
- EMBANKMENT FILL
- NATIVE MATERIALS
- SCREENED INTERVAL IN PIEZOMETER OR GROUNDWATER MONITORING WELL

NOTES

1. PIEZOMETERS P-505 AND P-506 WERE INSTALLED JUNE 29, 2010 AND JUNE 30, 2010 RESPECTIVELY.
2. THE IMPERIVOUS FILL AND RANDOM FILL ARE DRAWN AS SHOWN ON THE DESIGN PLANS.

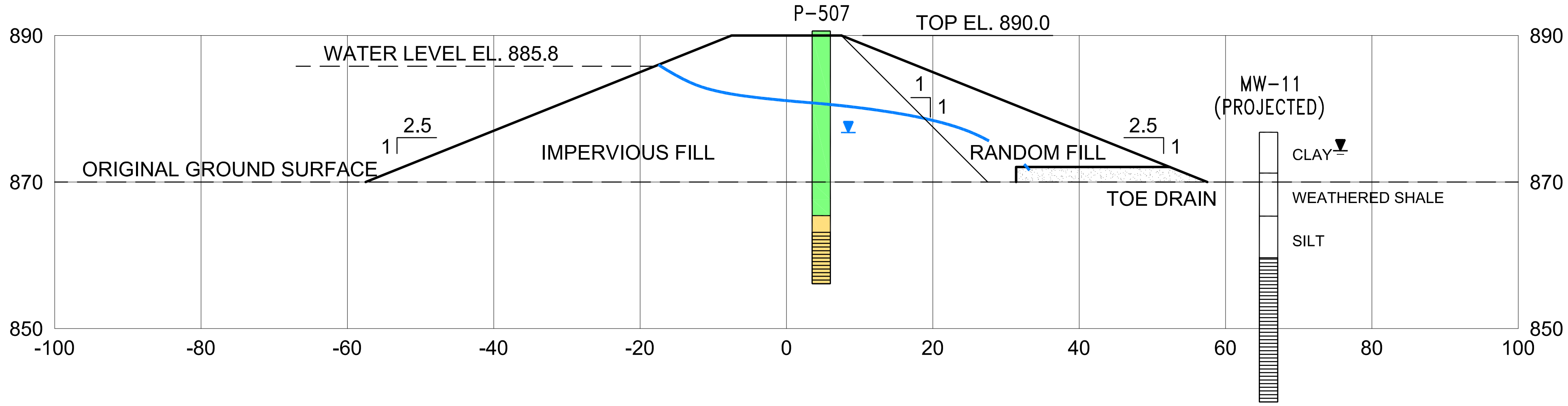
URS 8300 College Blvd., Suite 200 Overland Park, Kansas 66210

CLIENT: KANSAS CITY POWER & LIGHT COMPANY

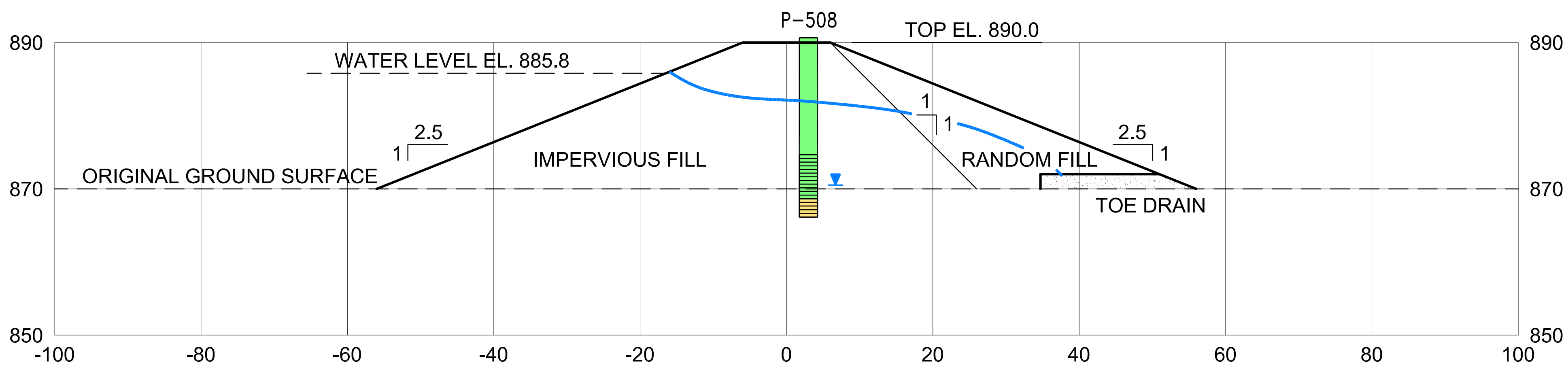
LOCATION: LA CYGNE GENERATING STATION

TITLE: EMBANKMENT CROSS SECTION AT P-505 AND P-506

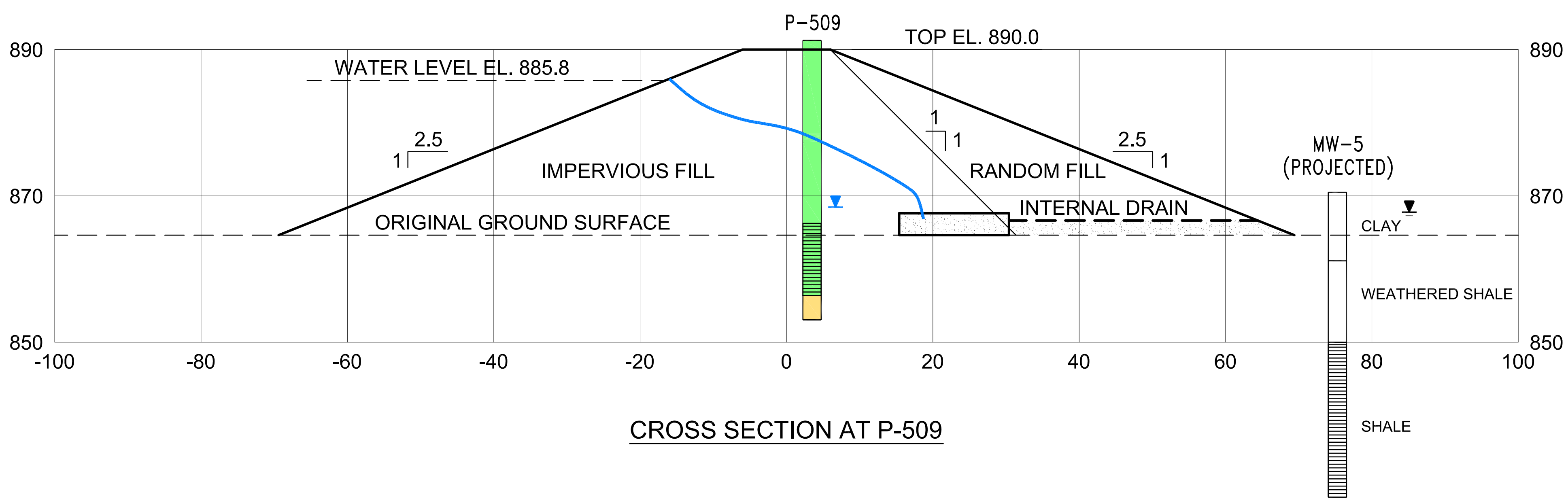
DRAWN BY	CHECKED BY	APPROVED BY
TMS	BDL	BDL
PROJECT NO.	DATE	FIGURE NO.
16530629	SEPT. 2010	10



CROSS SECTION AT P-507



CROSS SECTION AT P-508



CROSS SECTION AT P-509

LEGEND

- THEORETICAL PHREATIC SURFACE
- WATER LEVEL IN PIEZOMETER AUGUST 20, 2010
- WATER LEVEL IN GROUNDWATER MONITORING WELL JULY 20, 2010
- EMBANKMENT FILL
- NATIVE MATERIALS
- SCREENED INTERVAL IN PIEZOMETER OR GROUNDWATER MONITORING WELL

NOTES

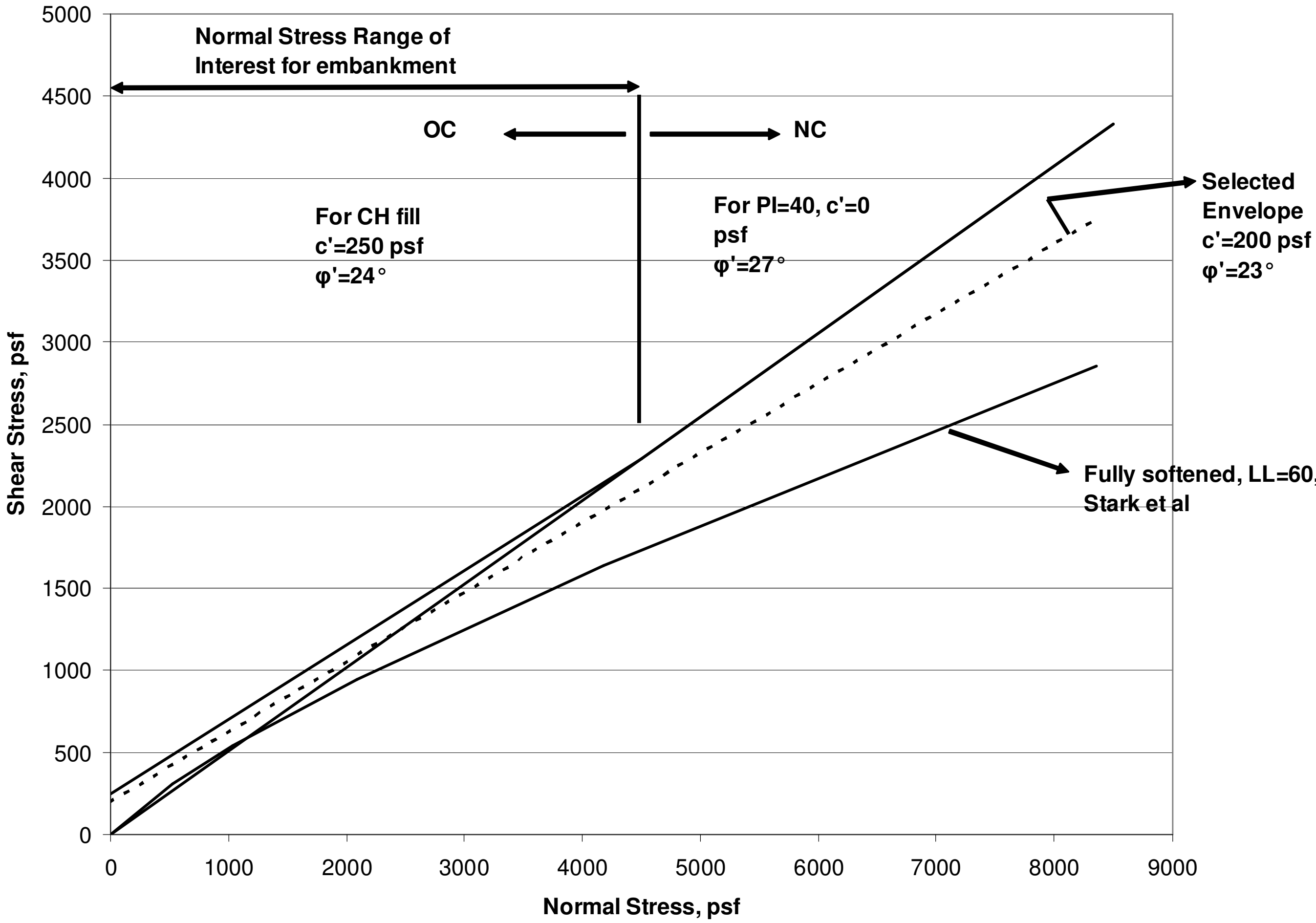
1. PIEZOMETERS P-507 AND P-508 WERE INSTALLED JULY 2, 2010. PIEZOMETER P-509 WAS INSTALLED JULY 1, 2010.
2. THE IMPERIVOUS FILL AND RANDOM FILL ARE DRAWN AS SHOWN ON THE DESIGN PLANS.

URS
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

CLIENT:	KANSAS CITY POWER & LIGHT COMPANY
LOCATION:	LA CYGNE GENERATING STATION
TITLE:	EMBANKMENT CROSS SECTION AT P-507, P-508 AND P-509

DRAWN BY	CHECKED BY	APPROVED BY
TMS	BDL	BDL
PROJECT NO.	DATE	FIGURE NO.
16530629	SEPT. 2010	11

September 9, 2010 3:11:38 pm (mik)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Geotech Report Embankment XS.dwg



URS
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

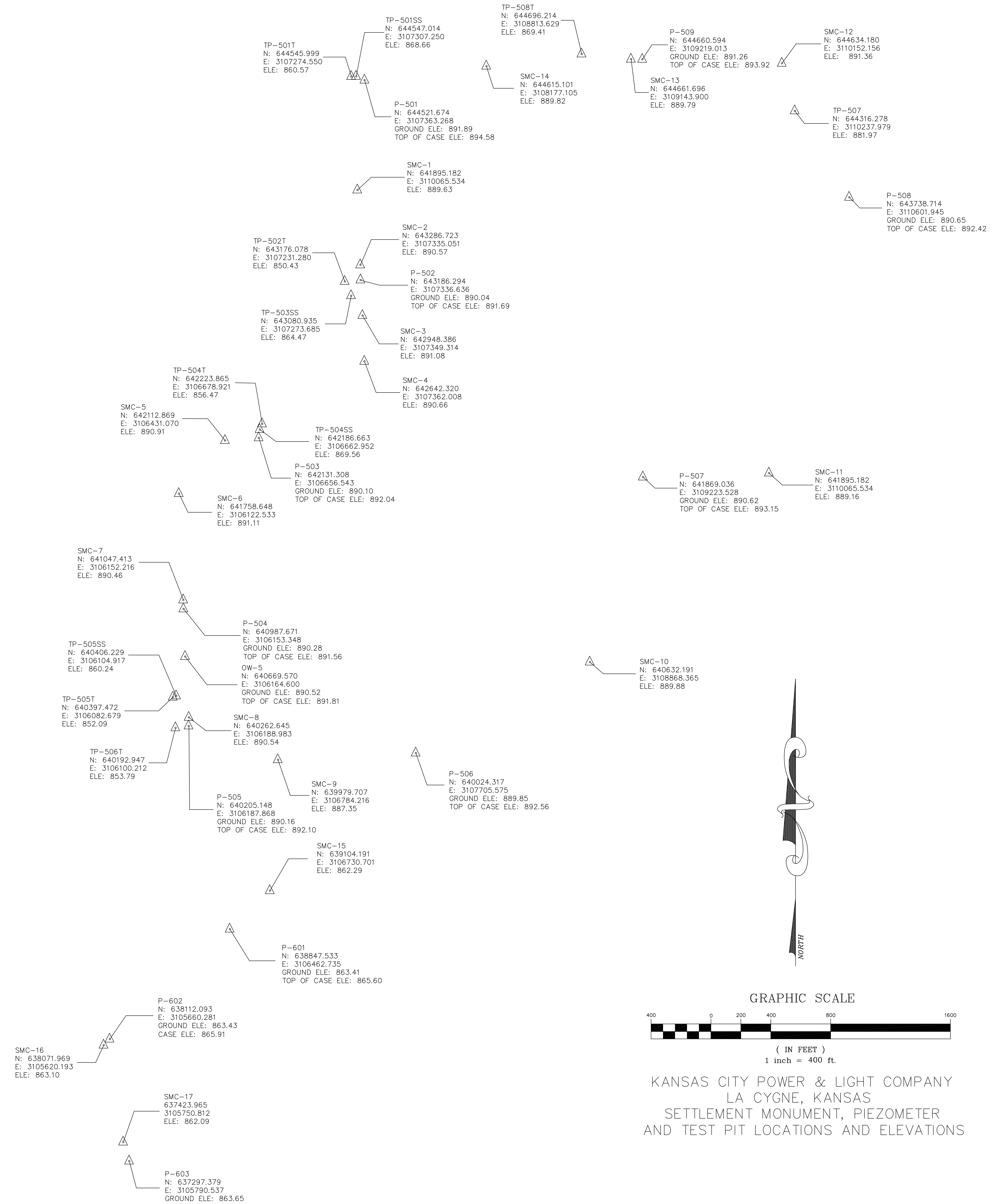
CLIENT: KANSAS POWER & LIGHT COMPANY

LOCATION: LA CYGNE GENERATING STATION

TITLE: SHEAR STRENGTH ENVELOPE FOR EMBANKMENT SOILS

DRAWN BY	CHECKED BY	APPROVED BY
TMS	BDL	BDL
PROJECT NO.	DATE	FIGURE NO.
16530629	SEPT. 2010	12

September 9, 2010 3:10.23 pm (mik)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Geotech Report Embankment XS.dwg



TALIAFERRO & BROWNE, INC.
CONSULTING ENGINEERS-SURVEYORS
132 ABBIE, KANSAS CITY, KANSAS, 66103
PH: (816) 283-3456 FAX: (913) 621-0049

URS CORPORATION

T & B PROJ. NO.
02-3751-001

drawing:
LACYGNE POWER PLANT.DWG

DESIGNED: ---- DATE: ---- DETAILED: ---- DATE: ----
CHECKED: JRM DATE: 7/28/10 DRAWN: CB SCALE: 1"=400'

LOCATION SURVEY

Drawing 1

September 20, 2010 8:39:03 am (mk)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Geotech Report Survey Points.dwg

BORING LOG NOMENCLATURE SHEET

TERM	IDENTIFICATION AND DESCRIPTION
SPT	Split-Spoon Sample (Standard Penetration Test): A 2-inch O.D., 1.5-inch I.D., split-barrel, 18 to 30-inch long sampler is driven by blows from a 140-pound hammer falling 30-inches. The number of blows required to advance the sampler three 6-inch increments are counted (See Sampling resistance below).
C	California Sample: Thick-wall sampler containing four nominal 2-inch diameter, 4-inch long brass liners. The sampler is hydraulically pushed a maximum of 12 inches.
ST	Shelby Tube sample: Hydraulically-pushed, 3-inch diameter, thin-walled tube used for obtaining undisturbed soil samples.
CME	CME 3-inch diameter continuous soil sampling system.
PS	Nominal 3-inch diameter Shelby tube piston sampler.
D	Disturbed sample or auger cuttings
NX	NX-size (2.155-inch diameter) rock core sample obtained using a diamond bit and recirculating water (See RQD below).
PP	Pocket Penetrometer measurement indicative of soil unconfined compressive strength (ksf).
TV	Torvane measurement of soil shear strength (tsf).
W %	As-received water content (percent)
LL	Liquid Limit
PL	Plastic Limit
USC	Unified Soil Classification
Qu	Unconfined compressive strength (ksf).
RQD	Rock Quality Designation: The sum of the lengths of intact core pieces 4 or more inches (10 cm) in length, measured along the center line of the core, and expressed as a percentage of the length cored.
REC	Recovery: The length of recovered soil or rock sample expressed as a percentage of the sample length or depth cored.
∇	Point of groundwater entry.
▼	Stabilized groundwater level at some time after drilling.

SAMPLING RESISTANCE

P	Sampler pushed by hydraulic system.
3 6 9	Numbers indicate the number of blows from a 140-pound hammer falling freely for 30 inches required to drive the SPT sampler 6 inches. The SPT test result, N-value, or blow count, is the number of blows required to drive the sampler the last 12 inches. The N value for this example is 15.
50/2"	The split-spoon sampler was driven 2 inches by 50 blows; the Standard Penetration Resistance, or N-value, is set at 100.

ABBREVIATIONS USED

HSA	Hollow-Stem Auger
SSA	Solid-Stem Auger
ATD	At the time of drilling
AD	After Drilling
NATD	None at Time of Drilling
DWL	Drill Water Loss

The relative density of coarse-grained soils (sands and gravels having less than 50 percent passing the number 200 sieve) is indicated by the uncorrected SPT test result (N-Value or blow count) in accordance with the relationships given below:

RELATIVE DENSITY	BLOW COUNT (N-VALUE)
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Greater than 50

The shear strengths of silts and clays (fine-grained soils having more than 50 percent passing the #200 sieve) are directly related to the torvane reading (TV) and my be taken to be equal to one half of the unconfined compressive strength (Qu) of the soil. Furthermore, the pocket penetrometer reading (PP) approximates Qu which is related to consistency and manual methods as indicated in the following table:

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (ksf)	MANUAL PROCEDURE
Very Soft	< 0.5	Extrudes between fingers
Soft	> 0.5 to 1	Molded by slight pressure
Medium Stiff	> 1 to 2	Molded by strong pressure
Stiff	>2 to 4	Indented by thumb
Very Stiff	> 4 to 8	Indented by thumbnail
Hard	> 8	Difficult to indent

Minor Soil Constituant Terms and Definitions

Trace	Less than 5 percent
Few	Between 5 and 10 percent
Little	Between 10 and 25 percent
Some	Between 25 and 50 percent

Coarse Grain Descriptors

Boulder	> 12 inches
Cobble	3 inches to 12 inches
Coarse Gravel	3 inches to 3/4 inches
Fine Gravel	3/4 inches to #4 sieve

The Graphical Key to Boring Logs shows the graphical symbols used on boring logs and generalized, geologic cross-sections of selected boring logs. The basic Unified Soil Classification System (USCS) designations are used for soils. The basic letter types are as follows: G - Gravels, S - Sands, M - Silts (M comes from the Swedish word mo for rock flour), W - Well graded, P - Poorly graded, C - Clay, H - High Plastic (fat), and L - Low Plastic (lean). Dual classification designations show the primary soil type throughout the graphic column, and the secondary soil type appears in the right half of the column. CL-CH, SP-GP, and GP-SP are examples.

TERM	MOISTURE CONDITION
Dry	Water content is less than the plastic limit; dry to the touch
Moist	Water content is greater than the plastic limit, but the soil may be damp but no visible water
Wet	Soil exhibits free water or is obviously saturated.

URS CORPORATION

URS

GRAPHICAL KEY TO BORING LOGS

SOIL TYPE	GRAPHICAL SYMBOLS				
GRAVELS	Well-Graded		Poorly-Graded		
	GW	GP-SP	GP	GM	GC
	GW-GM	GW-GC	GP-GM	GP-GC	GC-GM
SANDS	Well-Graded		Poorly-Graded		
	SW	SP-GP	SP	SM	SC
	SW-SM	SW-SC	SP-SM	SP-SC	SC-SM
SILTS and CLAYS	Silts		Clays		
	ML	MH	CL	CH	CL-ML
SPECIAL SYMBOLS	CL w/Sand	CH w/Sand	Low Plastic Till	High Plastic Till	Loess
ORGANIC SOILS	Organic Silts		Organic Clays		
	OL	OH	OL	OH	Peat
MISCEL-LANEOUS	Asphalt	Concrete	Topsoil	Fill	Void
IGNEOUS ROCKS	Granite	Breccia	Basalt	Lava	Tuff
METAMORPHIC ROCKS	Quartzite	Gneiss	Schist	Soapstone	Marble
SEDIMENTARY ROCKS	Limestone	Dolomite	Shale	Sandstone	Marl
	Coal	Conglomerate	Siltstone	Claystone	Chalk
MODIFIERS	Weathered	Calcareous	Cemented	Caliche	Chert
DRILLING METHODS	Solid-Stem Auger	Hollow-Stem Auger	Tri-Cone/ Mud-Rotary	NX Rock Core	Rock Drilling

These symbols may be overlaid on basic symbols to form new symbols. The fill symbol (see Miscellaneous above) may replace the right half of any primary (single-style) soil symbol to differentiate between fill types. The CL and CH symbols can be combined to represent medium plastic clays.

URS CORPORATION

URS

GRAPHIC BORING LOG

P-501

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station	SHEET	1 OF 2
PROJECT LOCATION:	La Cygne, Kansas	PROJECT NO:	16530629
LOGGED BY:	R. Exceen	RIG:	CME-55
DRILLING CO:	O'Malley Drilling	DATE:	7/1/2010
SURFACE ELEVATION:	891.9 ft.	NORTH:	644521.7
ELEVATION DATUM:		EAST:	3107363.3
GROUNDWATER ENTRY:	NATD	DELAYED GROUNDWATER:	NAD
OBSERVATIONS:			

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light and dark gray, high plastic CLAY (CH) (fill)			Boring advanced with 4.25" HSA
									890	
	C			50	P	4.0				
5										
									885	
	C			100	P	6.0	Becoming very stiff			
10										
									880	
	C			83	P	>9	Becoming hard, with rock and shale fragments			
15										
									875	
	C			75	P	>9	With occasional layers of weathered shale			
20										
									870	
	C			58	P	>9				
25										

OVP3 W/ NOTES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS GRAPHIC BORING LOG

P-501

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station	SHEET	2 OF 2
PROJECT LOCATION:	La Cygne, Kansas	PROJECT NO:	16530629
LOGGED BY:	R. Exceen	DRILLING CO: O'Malley Drilling	RIG: CME-55
SURFACE ELEVATION:	891.9 ft.	ELEVATION DATUM:	DATE: 7/1/2010
GROUNDWATER ENTRY:	NATD	DELAYED GROUNDWATER: NAD	NORTH: 644521.7
OBSERVATIONS:			EAST: 3107363.3

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
25							Hard, moist, mottled light brown with dark gray, high plastic CLAY (CH) with rock fragments (fill)		865	
	C			83	P	>9				
30										
31.5							Stiff to very stiff, mottled dark gray with yellowish brown, high plastic CLAY (CH) (residuum)		860	
	C			100	P	4.0	Becoming stiff, mottled yellowish orange with light and dark gray			
35									855	
	C			83	P					
39.4							SHALE: Olive gray, moderately weathered, hard			
40										
41.5							SANDSTONE: Light brown, fine grained, moderately weathered, hard		850	
43.4	SPT			100	50/5"		BOTTOM OF BORING P-501 AT 43.4 FEET			Piezometer installed upon completion
45									845	
50										

URS

GRAPHIC BORING LOG

P-502

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station	SHEET	1 OF 3
PROJECT LOCATION:	La Cygne, Kansas	PROJECT NO:	16530629
LOGGED BY: R. Exceen	DRILLING CO: O'Malley Drilling	RIG:	CME-55
SURFACE ELEVATION: 890.0 ft.	ELEVATION DATUM:	DATE:	7/1/2010
GROUNDWATER ENTRY: 53.5 ft.	DELAYED GROUNDWATER: NAD	NORTH:	643186.3
OBSERVATIONS:		EAST:	3107336.6

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Hard, moist, mottled yellowish brown with orange and light and dark gray, high plastic CLAY (CH) (fill)		890	Boring advanced with 4.25" HSA
	C			50	P	>9				
5									885	
	C			83	P	4.0	Becoming stiff with dark brown and gray layering			
10									880	
	C			92	P	>9	Becoming hard, with olive gray mottling and banding and shale fragments			
15									875	
	C			58	P	3.0	Becoming stiff			
20									870	
	C			75	P	6.0	Becoming very stiff			
25										

OVP3 W/ NOTES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS GRAPHIC BORING LOG

P-502

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station
PROJECT LOCATION:	La Cygne, Kansas
LOGGED BY:	R. Exceen
DRILLING CO:	O'Malley Drilling
SURFACE ELEVATION:	890.0 ft.
ELEVATION DATUM:	
GROUNDWATER ENTRY:	53.5 ft.
DELAYED GROUNDWATER:	NAD
OBSERVATIONS:	
SHEET	2 OF 3
PROJECT NO:	16530629
RIG:	CME-55
DATE:	7/1/2010
NORTH:	643186.3
EAST:	3107336.6

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
25							Very stiff, moist, mottled yellowish orange with light gray, high plastic CLAY (CH) with rock fragments (fill)		865	
	C			100	P	5.0				
30									860	
	C			75	P	8.0	Becoming hard, dark gray mottling and banding			
35									855	
	C			100	P	7.0	With rock and shale fragments			
40									850	
	C			92	P	7.0				
45									845	
	C			83	P	5.0	Becoming very stiff			
50							50.0			

OVP3 W/ NOTES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS GRAPHIC BORING LOG

P-502

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 3 OF 3
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55
SURFACE ELEVATION: 890.0 ft.
ELEVATION DATUM:
DATE: 7/1/2010
GROUNDWATER ENTRY: 53.5 ft.
DELAYED GROUNDWATER: NAD
NORTH: 643186.3
OBSERVATIONS:
EAST: 3107336.6

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
50							Very stiff, moist, light gray with yellowish orange mottling, high plastic CLAY (CH) (residuum)		840	
	C			100	P	5.0			▽	
55									835	
	C			100	P	2.0	Becoming stiff, olive gray with iron oxide nodules			
60									830	
							63.0			
							SHALE: Light gray, fresh, hard, fissile			
	SPT			100	50/4.8"		64.2			
							BOTTOM OF BORING P-502 AT 64.2 FEET			Piezometer installed upon completion
65									825	
70									820	
75										

URS

GRAPHIC BORING LOG

P-503

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 2
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55
SURFACE ELEVATION: 890.1 ft.
ELEVATION DATUM:
DATE: 6/30/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER: NAD
NORTH: 642131.3
OBSERVATIONS:
EAST: 3106656.5

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light gray and dark gray bands, high plastic CLAY (CH) (fill)		890	Boring advanced with 4.25" HSA
	C			67	P	4.0				
5									885	
	C			100	P	5.0	With light and dark gray mottling			
10									880	
	C			67	P	>9	Becoming hard, slightly moist, with weathered shale zones			
15									875	
	C			67	P	>9	With limestone fragments, fine angular gravel and coal fragments			
20									870	
	C			67	P	>9				
25										

URS

GRAPHIC BORING LOG

P-503

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 2 OF 2
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55
SURFACE ELEVATION: 890.1 ft.
ELEVATION DATUM:
DATE: 6/30/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER: NAD
NORTH: 642131.3
OBSERVATIONS:
EAST: 3106656.5

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
25							Hard, slightly moist, mottled yellowish orange with light and dark gray, high plastic CLAY (CH) with weathered shale fragments (fill)		865	
	C			67	P	>9				
30							With shale fragments grading out		860	
	C			100	P	>9	Becoming hard, dark gray mottling and banding			
35									855	
36.5							Stiff, moist, light brown, high plastic CLAY (CH) (residuum)			
	C			100	P	4.0	Becoming more moist			
40									850	
41.9							LIMESTONE (?) **BOTTOM OF BORING P-503 AT 41.9 FEET**			Piezometer installed upon completion
45									845	
50										

URS

GRAPHIC BORING LOG

P-504

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 2
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55
SURFACE ELEVATION: 890.3 ft.
ELEVATION DATUM:
DATE: 6/30/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER: NAD
NORTH: 640987.7
OBSERVATIONS:
EAST: 3106153.3

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light gray and dark gray bands, high plastic CLAY (CH) (fill)		890	Boring advanced with 4.25" HSA
	C			67	P	4.0				
5									885	
	C			67	P	7.0	Becoming stiff, with fine subangular gravel, coal, and shale fragments			
10									880	
	C			67	P	>9	Becoming hard			
15									875	
	C			100	P	>9				
20									870	
	C			92	P	>9	With occasional coarse sub-rounded gravel			
25										

OVP3 W/ NOTES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS

GRAPHIC BORING LOG

P-504

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 2 OF 2
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55
SURFACE ELEVATION: 890.3 ft.
ELEVATION DATUM:
DATE: 6/30/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER: NAD
NORTH: 640987.7
OBSERVATIONS:
EAST: 3106153.3

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
25							Hard, slightly moist, mottled yellowish brown with orange and light gray, dark gray, and olive gray, high plastic CLAY (CH) with shale and coal fragments (fill)		865	
	C			58	P	>9				
30									860	
	C			58	P	>9				
35									855	
	C			100	P	>9				
40									850	
42.5							SHALE: Olive gray, moderately weathered, hard, non-fissile			
	C			83	P	7.0	Becoming more moist			
45									845	
	C			100	P					Piezometer installed upon completion
49.5										
50							BOTTOM OF BORING P-504 AT 49.5 FEET			

SAMPLE DATA

URS GRAPHIC BORING LOG

P-505

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station	SHEET	1 OF 3
PROJECT LOCATION:	La Cygne, Kansas	PROJECT NO:	16530629
LOGGED BY: R. Exceen	DRILLING CO: O'Malley Drilling	RIG:	CME-55
SURFACE ELEVATION: 890.2 ft.	ELEVATION DATUM:	DATE:	6/29/2010
GROUNDWATER ENTRY: NATD	DELAYED GROUNDWATER: NAD	NORTH:	640205.1
OBSERVATIONS:		EAST:	3106187.9

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light gray and dark gray bands, high plastic CLAY (CH) with occasional fine gravel (fill) (top 6" is hard and dry)		890	Boring advanced with 4.25" HSA
	C			75	P	4.0				
5									885	
	C			83	P	6.0	Becoming stiff, with some very weathered shale fragments			
10									880	
	C			75	P	>9	Becoming hard with trace of small coal chips			
15									875	
	C			67	P	>9				
20									870	
	C			67	P	>9				
25										

URS GRAPHIC BORING LOG

P-505

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station	SHEET	2 OF 3
PROJECT LOCATION:	La Cygne, Kansas	PROJECT NO:	16530629
LOGGED BY: R. Exceen	DRILLING CO: O'Malley Drilling	RIG:	CME-55
SURFACE ELEVATION: 890.2 ft.	ELEVATION DATUM:	DATE:	6/29/2010
GROUNDWATER ENTRY: NATD	DELAYED GROUNDWATER: NAD	NORTH:	640205.1
OBSERVATIONS:		EAST:	3106187.9

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
25							Very stiff to hard, moist, mottled yellowish brown with orange, grayish green, and light gray, dark gray, and olive gray, high plastic CLAY (CH) with occasional rock and shale fragments (fill)		865	
	C			83	P	>9				
30							With zones of dry soil		860	
	C			67	P	>9				
35									855	
	C			58	P	8.0				
40									850	
	C			83	P	>9				
45									845	
	C			58	P	8.0				
50										

URS

GRAPHIC BORING LOG

P-505

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station	SHEET	3 OF 3
PROJECT LOCATION:	La Cygne, Kansas	PROJECT NO:	16530629
LOGGED BY: R. Exceen	DRILLING CO: O'Malley Drilling	RIG:	CME-55
SURFACE ELEVATION: 890.2 ft.	ELEVATION DATUM:	DATE:	6/29/2010
GROUNDWATER ENTRY: NATD	DELAYED GROUNDWATER: NAD	NORTH:	640205.1
OBSERVATIONS:		EAST:	3106187.9

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
50							Very stiff, slightly moist, mottled yellowish brown and orange with light and dark gray, high plastic CLAY (CH) (fill)		840	
52.0							SHALE: Greenish gray, slightly weathered, hard, non-fissile			
	C	■		50	P					
54.5										
55							BOTTOM OF BORING P-505 AT 54.5 FEET		835	Piezometer installed upon completion
60									830	
65									825	
70									820	
75										

OVP3 W/ NOTES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS GRAPHIC BORING LOG

P-506

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 2
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55
SURFACE ELEVATION: 889.9 ft.
ELEVATION DATUM:
DATE: 6/30/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER: NAD
NORTH: 640024.3
OBSERVATIONS:
EAST: 3107705.6

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light gray and dark gray, high plastic CLAY (CH) with manganese nodules (fill)			Boring advanced with 4.25" HSA
	C			83	P	3.0				
5									885	
	C			83	P	3.0				
10									880	
	C			79	P	8.0	Becoming hard			
15									875	
	C			83	P	6.0	Becoming very stiff, olive gray with mottled dark gray			
20									870	
	C			100	P	4.0	Becoming stiff, yellowish orange with mottled light and dark gray			
25									865	

OVP3 W/ NOTES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS

GRAPHIC BORING LOG

P-506

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 2 OF 2

PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629

LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55

SURFACE ELEVATION: 889.9 ft.
ELEVATION DATUM:
DATE: 6/30/2010

GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER: NAD
NORTH: 640024.3

OBSERVATIONS:
EAST: 3107705.6

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
25							Stiff, moist, mottled yellowish brown with orange and light gray, dark gray, and olive gray, high plastic CLAY (CH) (fill)			
	C			83	P	7.0	Becoming very stiff, with sandstone fragments			
30									860	
32.0							SHALE: Olive gray, moderately weathered, hard, non-fissile			
	C			58	P					
35									855	
40									850	
45									845	
47.3	SPT			100	50/3"		BOTTOM OF BORING P-506 AT 47.3 FEET			Piezometer installed upon completion
50									840	

URS GRAPHIC BORING LOG

P-507

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station — SHEET 1 OF 2
PROJECT LOCATION: La Cygne, Kansas — PROJECT NO: 16530629
LOGGED BY: R. Exceen — DRILLING CO: O'Malley Drilling — RIG: CME-55
SURFACE ELEVATION: 890.6 ft. — ELEVATION DATUM: — DATE: 7/2/2010
GROUNDWATER ENTRY: 28.5 ft. — DELAYED GROUNDWATER: NAD — NORTH: 641869.0
OBSERVATIONS: — EAST: 3109223.5

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light gray, high plastic CLAY (CH) (fill)		890	Boring advanced with 4.25" HSA
	C			58	P	3.0				
5									885	
	C			75	P	3.0	Becoming stiff to very stiff, with layers of dark gray			
10									880	
	C			83	P	5.0	Becoming very stiff			
15									875	
	C			100	P	5.0				
20									870	
23.0							Stiff, moist, dark gray, high plastic CLAY (CH) with root hairs and occasional sub-rounded pebbles (residuum)			
	C			100	P	4.0				
25										

OVP3 W/ NOTES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS GRAPHIC BORING LOG

P-507

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station	SHEET	2 OF 2
PROJECT LOCATION:	La Cygne, Kansas	PROJECT NO:	16530629
LOGGED BY:	R. Exceen	DRILLING CO:	O'Malley Drilling
RIG:	CME-55		
SURFACE ELEVATION:	890.6 ft.	ELEVATION DATUM:	
DATE:	7/2/2010		
GROUNDWATER ENTRY:	28.5 ft.	DELAYED GROUNDWATER:	NAD
NORTH:	641869.0		
OBSERVATIONS:		EAST:	3109223.5

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
25							Very stiff, moist, mottled yellowish brown with orange and light, high plastic CLAY (CH) (residuum)		865	
	C			100	P	6.0		∇		
30									860	
							32.0			
							SHALE: Olive gray, moderately weathered, medium hard, with iron oxide staining			
	C			67	P					
							34.5			
35							**BOTTOM OF BORING P-507 AT 34.5 FEET**		855	Piezometer installed upon completion
40									850	
45									845	
50										

URS

GRAPHIC BORING LOG

P-508

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55
SURFACE ELEVATION: 890.7 ft.
ELEVATION DATUM:
DATE: 7/2/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER: NAD
NORTH: 643738.7
OBSERVATIONS:
EAST: 3110601.9

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light gray, high plastic CLAY (CH) (fill)		890	Boring advanced with 4.25" HSA
	C			58	P	1.5				
5									885	
	C			50	P	5.0	Becoming very stiff, with olive gray mottling, some shale fragments			
10									880	
	C			100	P	>9	Becoming hard			
15									875	
	C			50	P	7.0				
20									870	
22.0							SHALE: Olive gray, moderately weathered, medium hard, non-fissile			
	C			50	P					
24.5							BOTTOM OF BORING P-508 AT 24.5 FEET			Piezometer installed upon completion
25										

OVP3 W/ NOTES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS

GRAPHIC BORING LOG

P-509

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station | SHEET 1 OF 2
PROJECT LOCATION: La Cygne, Kansas | PROJECT NO: 16530629
LOGGED BY: R. Exceen | DRILLING CO: O'Malley Drilling | RIG: CME-55
SURFACE ELEVATION: 891.3 ft. | ELEVATION DATUM: | DATE: 7/1/2010
GROUNDWATER ENTRY: 31 ft. | DELAYED GROUNDWATER: NAD | NORTH: 644660.6
OBSERVATIONS: | EAST: 3109219.0

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light gray and dark gray, high plastic CLAY (CH) (fill)		890	Boring advanced with 4.25" HSA
5	C			58	P	4.0	With some rock fragments		885	
10	C			75	P	4.0	With olive gray mottling, some rock and shale fragments		880	
15	C			58	P	7.0	Becoming very stiff		875	
20	C			83	P	4.0	Becoming stiff		870	
25	C			50	P	>9	Becoming hard			
							25.0			

URS GRAPHIC BORING LOG

P-509

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 2 OF 2
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55
SURFACE ELEVATION: 891.3 ft.
ELEVATION DATUM:
DATE: 7/1/2010
GROUNDWATER ENTRY: 31 ft.
DELAYED GROUNDWATER: NAD
NORTH: 644660.6
OBSERVATIONS:
EAST: 3109219.0

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
25							Stiff, moist, light gray with mottled yellowish orange, high plastic CLAY (CH) with iron oxide staining (residuum)		865	
	C	■		75	P	5.0				
30									▽ 860	
							32.0			
							SHALE:			
	SPT			0	18 29 36					Cal. sample attempted; no recovery; SPT sample attempted; no recovery
35							35.0			
							BOTTOM OF BORING P-509 AT 35.0 FEET		855	Piezometer installed upon completion
40									850	
45									845	
50										

URS

GRAPHIC BORING LOG

P-601

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1

PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629

LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55

SURFACE ELEVATION: 863.4 ft.
ELEVATION DATUM:
DATE: 7/6/2010

GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER: NAD
NORTH: 638847.5

OBSERVATIONS:
EAST: 3106462.7

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light gray and dark gray, high plastic CLAY (CH) (fill)			Boring advanced with 4.25" HSA
	C			75	P	4.0			860	
5										
	ST			100	P	4.0			855	
9.5							Stiff, moist, dark gray, high plastic CLAY (CH) (residuum)			
10										
							Becoming mottled yellowish orange with light gray		850	
	ST			100	P	4.0				
15										
	C			75	P	2.0	Becoming medium stiff		845	
20										
21.5							SHALE: Olive gray, highly weathered, soft, with iron oxide staining			
	C			75	P				840	
24.5							BOTTOM OF BORING P-601 AT 24.5 FEET			Piezometer installed upon completion
25										

OVP3 W/ NOTES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS

GRAPHIC BORING LOG

P-602

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55
SURFACE ELEVATION: 863.4 ft.
ELEVATION DATUM:
DATE: 7/6/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER: NAD
NORTH: 638112.1
OBSERVATIONS:
EAST: 3105660.3

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light gray, high plastic CLAY (CH) (fill)			Boring advanced with 4.25" HSA
									860	
	C			75	P	2.0				
5										
									855	
	ST			100	P	3.0				
								9.5		
10							Very stiff, moist, dark gray, high plastic CLAY (CH) (residuum)			
									850	
	ST			100	P	7.0				
15										
									845	Lost sample due to drilling error
20							Becoming mottled yellowish orange with light gray, with a blocky structure			
									840	Piezometer installed upon completion
	C			100	P	5.0				
25								24.9		

BOTTOM OF BORING P-602 AT 24.9 FEET

URS

GRAPHIC BORING LOG

P-603

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: O'Malley Drilling
RIG: CME-55
SURFACE ELEVATION: 863.7 ft.
ELEVATION DATUM:
DATE: 7/7/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER: NAD
NORTH: 637297.4
OBSERVATIONS:
EAST: 3105790.5

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, mottled yellowish brown with orange and light gray and dark gray, high plastic CLAY (CH) with rock fragments (fill)			Boring advanced with 4.25" HSA
	C			75	P	3.0			860	
5										
	C			75	P	6.0	Becoming very stiff, with olive gray layering		855	
10										
	C			75	P	5.0	Becoming stiff to very stiff, moist, yellowish orange with light gray mottling		850	
15										
	C			83	P	4.0			845	
20								20.1		
							BOTTOM OF BORING P-603 AT 20.1 FEET			Piezometer installed upon completion
									840	
25										

URS

GRAPHIC TEST PIT LOG

TP-501SS

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: Kissick Construction Co.
RIG: Case 580 Backhoe
SURFACE ELEVATION: 868.7 ft.
ELEVATION DATUM:
DATE: 7/14/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER:
NORTH: 644547.0
OBSERVATIONS:
EAST: 3107307.25

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	ft × ft (DESCRIPTION)	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark gray, high plastic CLAY (CH) with some organics (fill)			
1.8							Stiff, moist, mottled olive gray with yellowish brown, high plastic CLAY (CH) with abundant shale fragments up to 4" (fill)		865	Although there are larger shale fragments in this test pit, the clay/shale mixture appears to be well compacted
5										
7.5							BOTTOM OF TP-501SS AT 7.5 FEET		860	
10										

OVP3 W/ NOTES-TEST PIT W/ N&E COORD. 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS

GRAPHIC TEST PIT LOG

TP-501T

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: Kissick Construction Co.
RIG: Case 580 Backhoe
SURFACE ELEVATION: 860.6 ft.
ELEVATION DATUM:
DATE: 7/15/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER:
NORTH: 644546.0
OBSERVATIONS:
EAST: 3107274.55

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	← ft → / ft	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark gray, high plastic CLAY (CH) with some organics (fill)		860	
1.5							Stiff, moist, dark gray with mottled olive gray, high plastic CLAY (CH) (fill)			
	D									
2.8							Stiff, moist, light brown, high plastic CLAY (CH) (residuum)			
3.8							**BOTTOM OF TP-501T AT 3.8 FEET**			
5									855	
10										

OVP3 W/ NOTES-TEST PIT W/ N&E COORD. 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS

GRAPHIC TEST PIT LOG

TP-502T

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1

PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629

LOGGED BY: R. Exceen
DRILLING CO: Kissick Construction Co.
RIG: Case 580 Backhoe

SURFACE ELEVATION: 850.4 ft.
ELEVATION DATUM:
DATE: 7/14/2010

GROUNDWATER ENTRY: 3.2 ft.
DELAYED GROUNDWATER:
NORTH: 643176.1

OBSERVATIONS:
EAST: 3107231.28

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	Description (ft × ft)	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark gray, high plastic CLAY (CH) with some organics (fill)		850	
2.0							Stiff, moist, mottled light gray with yellowish orange, high plastic CLAY (CH) (fill)			
3.2	D						Black bottom ash (fill)			Water enters test pit at ~3.2'
3.8							BOTTOM OF TP-502T AT 3.8 FEET			
5									845	
10										

URS

GRAPHIC TEST PIT LOG

TP-503SS

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: Kissick Construction Co.
RIG: Case 580 Backhoe
SURFACE ELEVATION: 864.5 ft.
ELEVATION DATUM:
DATE: 7/14/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER:
NORTH: 643080.9
OBSERVATIONS:
EAST: 3107273.69

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	ft × ft	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark brown, high plastic CLAY (CH) with some organics (fill)			
3.0							Stiff, moist, mottled yellowish orange with light and dark gray, high plastic CLAY (CH) with shale and rock fragments (fill)		860	
5	D									
7.0							**BOTTOM OF TP-503SS AT 7.0 FEET**			
10									855	

OVP3 W/ NOTES-TEST PIT W/ N&E COORD. 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS

GRAPHIC TEST PIT LOG

TP-504SS

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station	SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas	PROJECT NO: 16530629
LOGGED BY: B. Linnan — DRILLING CO: Kissick Construction Co.	RIG: Case 580 Backhoe
SURFACE ELEVATION: 869.6 ft. — ELEVATION DATUM:	DATE: 7/14/2010
GROUNDWATER ENTRY: NATD — DELAYED GROUNDWATER:	NORTH: 642186.7
OBSERVATIONS:	EAST: 3106662.95

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	Description (ft × ft)	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark brown, high plastic CLAY (CH) with organics (fill)			
1.5							Stiff, moist, brown with some gray and black, high plastic CLAY (CH) with gravel-size limestone and shale fragments(fill)			
	D								865	
5										
6.0							Stiff, moist, gray and brown, high plastic CLAY (CH) with small shale fragments (fill) (no limestone fragments noted after 6')			
	D									
9.0							**BOTTOM OF TP-504SS AT 9.0 FEET**		860	
10										

OVP3 W/ NOTES-TEST PIT W/ N&E COORD. 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS GRAPHIC TEST PIT LOG

TP-504T

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: B. Linnan
DRILLING CO: Kissick Construction Co.
RIG: Case 580 Backhoe
SURFACE ELEVATION: 856.5 ft.
ELEVATION DATUM:
DATE: 7/14/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER:
NORTH: 642223.9
OBSERVATIONS:
EAST: 3106678.92

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	ft × ft	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark brown, high plastic CLAY (CH) with organics (fill)			Stake for survey location set at east end of test pit
1.0							Stiff, moist, brown with dark gray, high plastic CLAY (CH) with some small shale fragments (fill)		855	Note: Very small amount of water entered the bottom of the west end of the test pit. Quantity limited; rate about equal to evaporation; no other water observed
2.6							Stiff, moist, brown and gray, high plastic CLAY (CH) (residuum) (weathered shale)			
4.5							BOTTOM OF TP-504T AT 4.5 FEET			
5									850	
10										

OVP3 W/ NOTES-TEST PIT W/ N&E COORD. 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS

GRAPHIC TEST PIT LOG

TP-505SS

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: B. Linnan
DRILLING CO: Kissick Construction Co.
RIG: Case 580 Backhoe
SURFACE ELEVATION: 860.2 ft.
ELEVATION DATUM:
DATE: 7/14/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER:
NORTH: 640406.2
OBSERVATIONS:
EAST: 3106104.92

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	Description (ft × ft)	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark brown, high plastic CLAY (CH) with organics (fill)		860	
2.8							Stiff, moist,gray and brown, high plastic CLAY (CH) with some small shale fragments (fill)			Material appears to be well compacted small shale pieces surrounded by a high plastic clay matrix. No voids observed
5	D								855	
8.0							BOTTOM OF TP-505SS AT 8.0 FEET			
10										

OVP3 W/ NOTES-TEST PIT W/ N&E COORD. 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS

GRAPHIC TEST PIT LOG

TP-505T

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: B. Linnan
DRILLING CO: Kissick Construction Co.
RIG: Case 580 Backhoe
SURFACE ELEVATION: 852.1 ft.
ELEVATION DATUM:
DATE: 7/14/2010
GROUNDWATER ENTRY: 2 ft.
DELAYED GROUNDWATER:
NORTH: 640397.5
OBSERVATIONS:
EAST: 3106082.68

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	← ft → / ft	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark brown, high plastic CLAY (CH) with some organics (fill)			
1.5							Stiff, moist, brown, high plastic CLAY (CH) with small shale fragments (fill)		850	Water enters at 2.0'
2.5							Black bottom ash (fill)			
3.0							BOTTOM OF TP-505T AT 3.0 FEET			Note: Red stained water at surface. Cattails in area of test pit. Toe of slope is saturated. Left open for 4 hours. Filled with water t ground surface.
5										
									845	
10										

OVP3 W/ NOTES-TEST PIT W/ N&E COORD. 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS

GRAPHIC TEST PIT LOG

TP-506T

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: B. Linnan
DRILLING CO: Kissick Construction Co.
RIG: Case 580 Backhoe
SURFACE ELEVATION: 853.8 ft.
ELEVATION DATUM:
DATE: 7/14/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER:
NORTH: 640192.9
OBSERVATIONS:
EAST: 3106100.21

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	← ft → / ft	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark brown, high plastic CLAY (CH) with some organics (fill)			
2.7							Stiff, moist, gray and brown, high plastic CLAY (CH) with small content of shale fragments less than 2" (fill)		850	
4.5	D						Black bottom ash (fill) (outlet for internal drainage within the dam)			Water flowing out of bottom ash drain
5.0							BOTTOM OF TP-506T AT 5.0 FEET			
10									845	

URS GRAPHIC TEST PIT LOG

TP-507

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: Kissick Construction Co.
RIG: Case 580 Backhoe
SURFACE ELEVATION: 882.0 ft.
ELEVATION DATUM:
DATE: 7/15/2010
GROUNDWATER ENTRY: 5.6 ft.
DELAYED GROUNDWATER:
NORTH: 644316.3
OBSERVATIONS:
EAST: 3110237.98

DEPTH (feet)	SAMPLE DATA: TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	DESCRIPTION (← ft →, ↕ ft)	SYMBOL	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark gray, high plastic CLAY (CH) with some organics (fill)			
0.5							Stiff, moist, mottled yellowish orange with light gray, high plastic CLAY (CH) with shale fragments (fill)			
	D								880	
5										
5.6							Black bottom ash (fill)	∇		
	D								875	
7.7	D						Moist, mottled yellowish orange with light gray, high plastic CLAY (CH) with shale fragments (fill)			
8.0							**BOTTOM OF TP-507 AT 8.0 FEET**			
10										

OVP3 W/ NOTES-TEST PIT W/ N&E COORD. 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

URS | # GRAPHIC TEST PIT LOG | # TP-508T

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
SHEET 1 OF 1
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
LOGGED BY: R. Exceen
DRILLING CO: Kissick Construction Co.
RIG: Case 580 Backhoe
SURFACE ELEVATION: 869.4 ft.
ELEVATION DATUM:
DATE: 7/15/2010
GROUNDWATER ENTRY: NATD
DELAYED GROUNDWATER:
NORTH: 644696.2
OBSERVATIONS:
EAST: 3108813.63

DEPTH (feet)	TYPE	RECOVERY	RQD LENGTH	REC/RQD (%)	RESISTANCE/N COMPONENTS	PP (KSF)	← ft → / ft	Depth	ELEVATION (feet)	FIELD NOTES
0							Stiff, moist, dark gray, high plastic CLAY (CH) with some organics (fill)	0.7		
	D						Stiff, moist, mottled yellowish orange with light gray, high plastic CLAY (CH) with shale fragments (fill)	2.1		
	D						Stiff, moist, dark gray, high plastic CLAY (CH), blocky structure, with iron oxide and root hairs (residuum)	3.7		
							BOTTOM OF TP-508T AT 3.7 FEET		865	
5										
10									860	

OVP3 W/ NOTES-TEST PIT W/ N&E COORD. 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

PIEZOMETER REPORT

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
MW/PZ NO: P-501

PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629

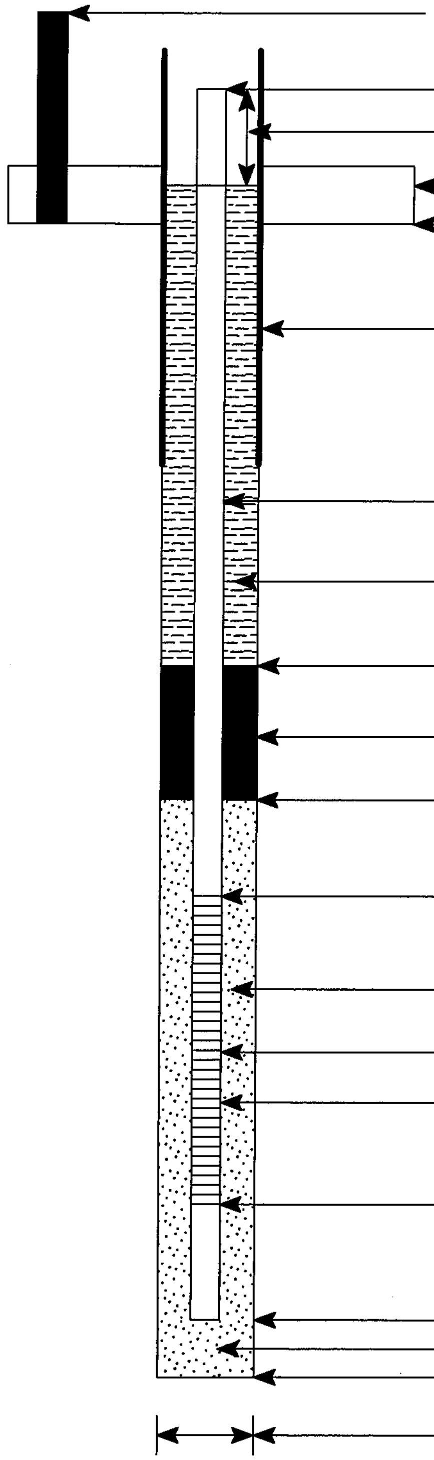
INSTALLED BY: O'Malley Drilling
DATE: 7/1/2010

INSPECTED BY: R. Exceen
GRND ELEV: 891.89

METHOD OF INSTALLATION: Through HSA
NORTH: 644521.674

OBSERVATIONS:
EAST: 3107363.268

For detailed geologic descriptions see boring log: P-501



Number/Type of Protective Post: Three 3" dia. x 6.5' long steel with 4.5' stick-up

Elevation of top of riser pipe: 894.6

Above ground stickup: 2.9'

Type of surface seal/pad: Concrete

Depth of surface seal: 2.0'

I.D./Type of surface casing: 4" square 5' long aluminum

I.D./Type of riser pipe: 2" dia. flush-joint Sch. 40 PVC

Type of backfill: Bentonite grout

Depth of top of seal: 26.1'

Type of seal: Granular bentonite

Depth of top of filter pack: 28.5'

Depth of top of screen: 32.0'

Type of filter pack: 12-20 sand

I.D./Type of screen: 2" dia. flush-joint slotted Sch. 40 PVC

Screen slot size: 0.01"

Depth of bottom of screen: 41.8'

Depth of bottom of plugged blank section: 42.3'

Type of backfill below well/pz: 12-20 sand

Depth of bottom of boring: 43.4'

Diameter of boring: 8"

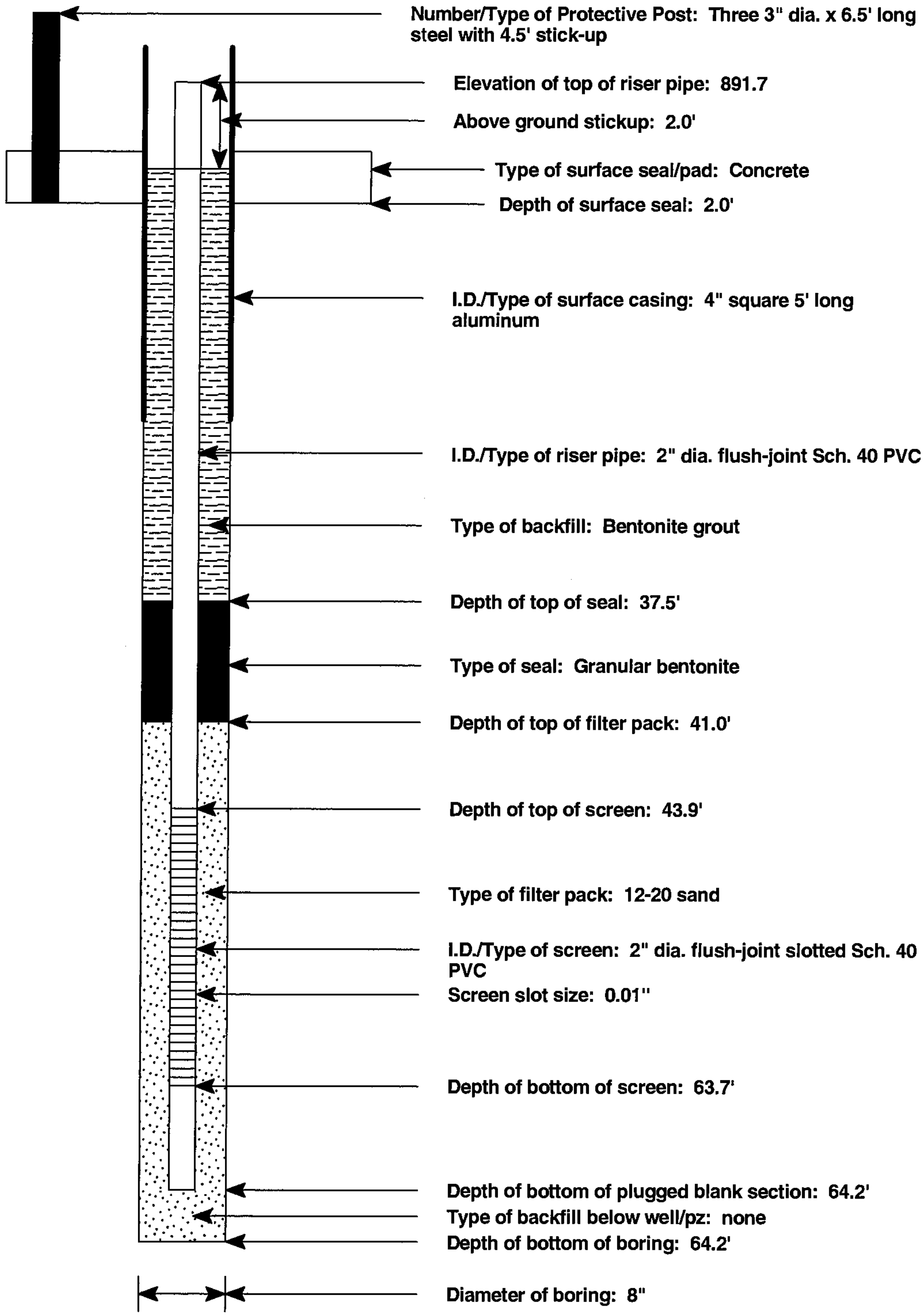
Note: Depths are in feet below grade.

PIEZOMETER REPORT

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
PROJECT LOCATION: La Cygne, Kansas
INSTALLED BY: O'Malley Drilling
INSPECTED BY: R. Exceen
METHOD OF INSTALLATION: Through HSA
OBSERVATIONS:

MW/PZ NO: P-502
PROJECT NO: 16530629
DATE: 7/1/2010
GRND ELEV: 890.04
NORTH: 643186.294
EAST: 3107336.636

For detailed geologic descriptions see boring log: P-502



Note: Depths are in feet below grade.

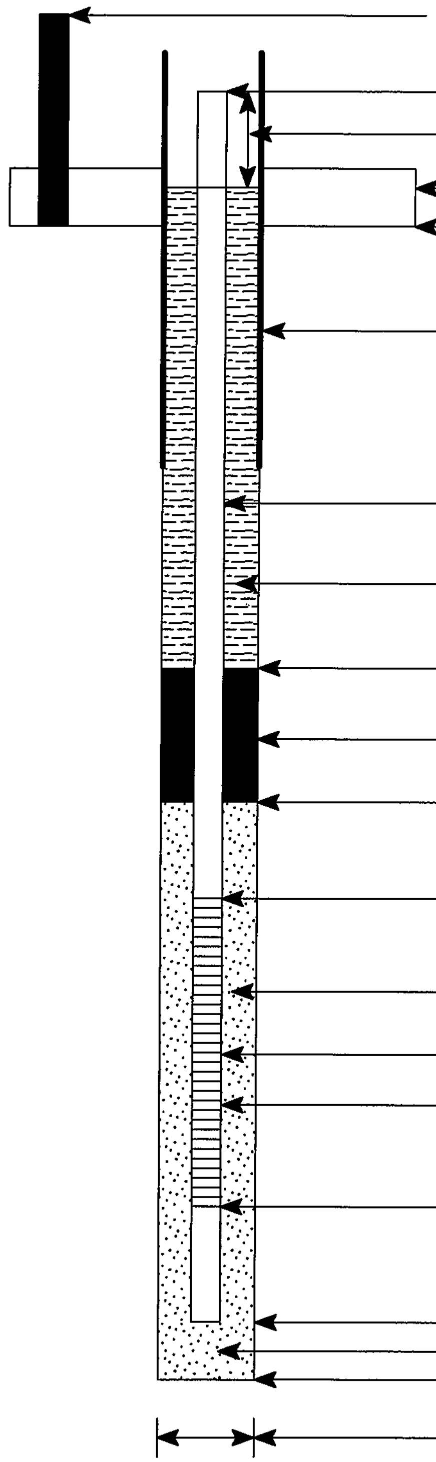
MW-PZ REPORT 16530629LACYGNE.GPJ OVP1.GDT 9/9/10

URS

PIEZOMETER REPORT

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
MW/PZ NO: P-503
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
INSTALLED BY: O'Malley Drilling
DATE: 6/30/2010
INSPECTED BY: R. Exceen
GRND ELEV: 890.1
METHOD OF INSTALLATION: Through HSA
NORTH: 642131.308
OBSERVATIONS:
EAST: 3106656.543

For detailed geologic descriptions see boring log: P-503



Number/Type of Protective Post: Three 3" dia. x 6.5' long steel with 4.5' stick-up

Elevation of top of riser pipe: 892.0

Above ground stickup: 2.2'

Type of surface seal/pad: Concrete

Depth of surface seal: 2.0'

I.D./Type of surface casing: 4" square 5' long aluminum

I.D./Type of riser pipe: 2" dia. flush-joint Sch. 40 PVC

Type of backfill: Bentonite grout

Depth of top of seal: 26.5'

Type of seal: Granular bentonite

Depth of top of filter pack: 28.6'

Depth of top of screen: 31.6'

Type of filter pack: 12-20 sand

I.D./Type of screen: 2" dia. flush-joint slotted Sch. 40 PVC

Screen slot size: 0.01"

Depth of bottom of screen: 41.4'

Depth of bottom of plugged blank section: 41.9'

Type of backfill below well/pz: none

Depth of bottom of boring: 41.9'

Diameter of boring: 8"

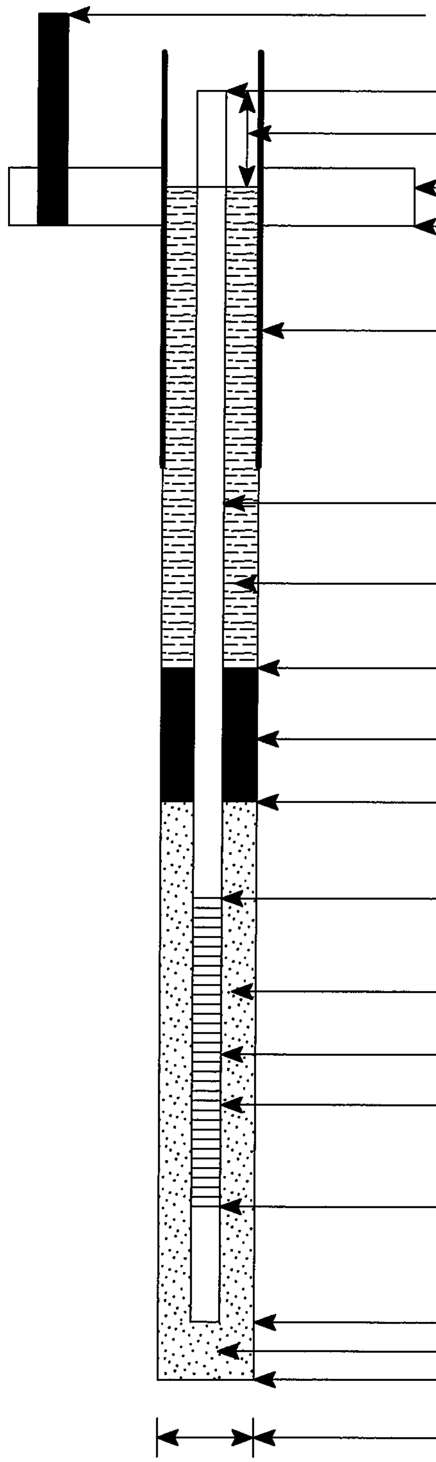
Note: Depths are in feet below grade.

URS

PIEZOMETER REPORT

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station	MW/PZ NO: P-504
PROJECT LOCATION: La Cygne, Kansas	PROJECT NO: 16530629
INSTALLED BY: O'Malley Drilling	DATE: 6/30/2010
INSPECTED BY: R. Exceen	GRND ELEV: 890.28
METHOD OF INSTALLATION: Through HSA	NORTH: 640987.671
OBSERVATIONS:	EAST: 3106153.348

For detailed geologic descriptions see boring log: P-504



Number/Type of Protective Post: Three 3" dia. x 6.5' long steel with 4.5' stick-up

Elevation of top of riser pipe: 891.6

Above ground stickup: 1.6'

Type of surface seal/pad: Concrete

Depth of surface seal: 2.0'

I.D./Type of surface casing: 4" square 5' long aluminum

I.D./Type of riser pipe: 2" dia. flush-joint Sch. 40 PVC

Type of backfill: Bentonite grout

Depth of top of seal: 32.5'

Type of seal: Granular bentonite

Depth of top of filter pack: 34.7'

Depth of top of screen: 38.4'

Type of filter pack: 12-20 sand

I.D./Type of screen: 2" dia. flush-joint slotted Sch. 40 PVC

Screen slot size: 0.01"

Depth of bottom of screen: 48.2'

Depth of bottom of plugged blank section: 48.7'

Type of backfill below well/pz: 12-20 sand

Depth of bottom of boring: 49.5'

Diameter of boring: 8"

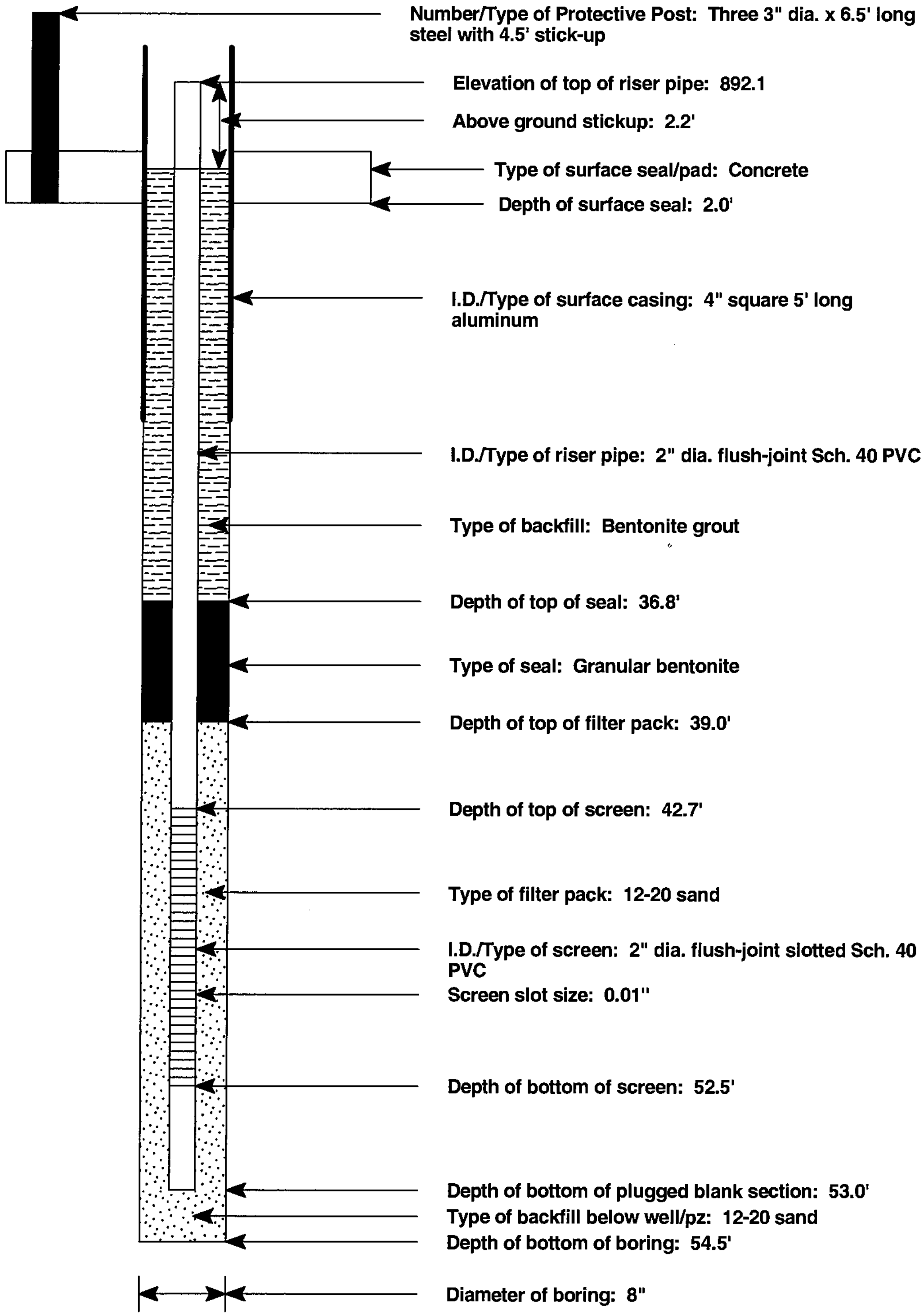
Note: Depths are in feet below grade.

PIEZOMETER REPORT

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
PROJECT LOCATION: La Cygne, Kansas
INSTALLED BY: O'Malley Drilling
INSPECTED BY: R. Exceen
METHOD OF INSTALLATION: Through HSA
OBSERVATIONS:

MW/PZ NO: P-505
PROJECT NO: 16530629
DATE: 6/29/2010
GRND ELEV: 890.16
NORTH: 640205.148
EAST: 3106187.868

For detailed geologic descriptions see boring log: P-505



Note: Depths are in feet below grade.

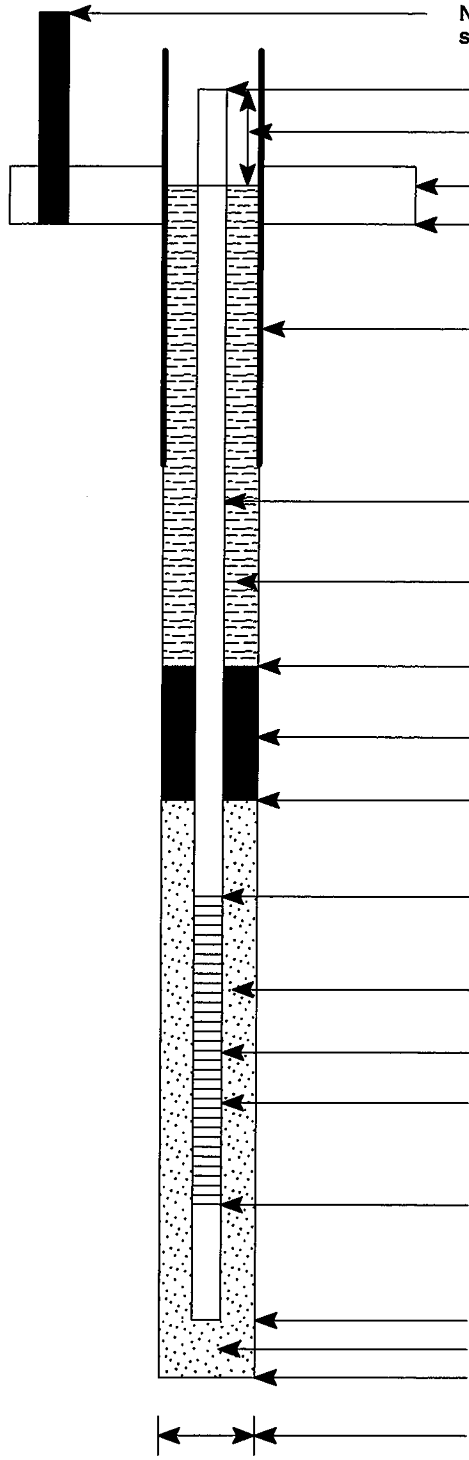
MW-PZ REPORT 16530629LACYGNE.GPJ OVP1.GDT 9/9/10

URS

PIEZOMETER REPORT

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station	MW/PZ NO:	P-506
PROJECT LOCATION:	La Cygne, Kansas	PROJECT NO:	16530629
INSTALLED BY:	O'Malley Drilling	DATE:	6/30/2010
INSPECTED BY:	R. Exceen	GRND ELEV:	889.85
METHOD OF INSTALLATION:	Through HSA	NORTH:	640024.317
OBSERVATIONS:		EAST:	3107705.575

For detailed geologic descriptions see boring log: P-506



Number/Type of Protective Post: Three 3" dia. x 6.5' long steel with 4.5' stick-up

Elevation of top of riser pipe: 892.6

Above ground stickup: 3.1'

Type of surface seal/pad: Concrete

Depth of surface seal: 2.0'

I.D./Type of surface casing: 4" square 7' long aluminum

I.D./Type of riser pipe: 2" dia. flush-joint Sch. 40 PVC

Type of backfill: Bentonite grout

Depth of top of seal: 31.1'

Type of seal: Granular bentonite

Depth of top of filter pack: 34.2'

Depth of top of screen: 37.0'

Type of filter pack: 12-20 sand

I.D./Type of screen: 2" dia. flush-joint slotted Sch. 40 PVC

Screen slot size: 0.01"

Depth of bottom of screen: 46.8'

Depth of bottom of plugged blank section: 47.3'

Type of backfill below well/pz: none

Depth of bottom of boring: 47.3'

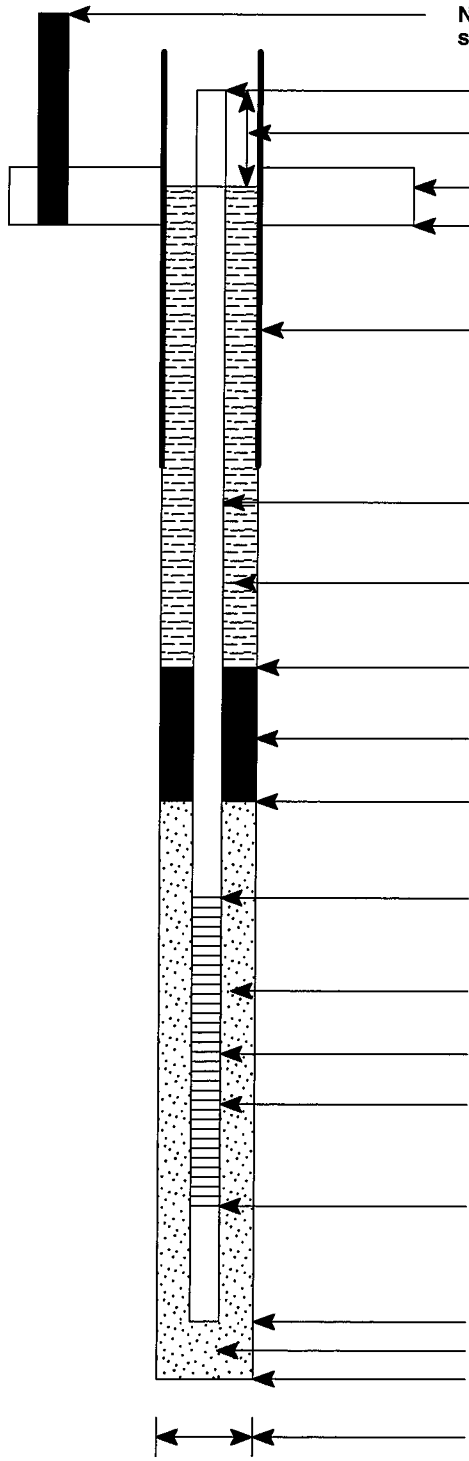
Diameter of boring: 8"

Note: Depths are in feet below grade.

PIEZOMETER REPORT

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station	MW/PZ NO:	P-507
PROJECT LOCATION:	La Cygne, Kansas	PROJECT NO:	16530629
INSTALLED BY:	O'Malley Drilling	DATE:	7/2/2010
INSPECTED BY:	R. Exceen	GRND ELEV:	890.62
METHOD OF INSTALLATION:	Through HSA	NORTH:	641869.036
OBSERVATIONS:		EAST:	3109223.528

For detailed geologic descriptions see boring log: P-507



Number/Type of Protective Post: Three 3" dia. x 6.5' long steel with 4.5' stick-up

Elevation of top of riser pipe: 893.2

Above ground stickup: 2.6'

Type of surface seal/pad: Concrete

Depth of surface seal: 2.0'

I.D./Type of surface casing: 4" square 7' long aluminum

I.D./Type of riser pipe: 2" dia. flush-joint Sch. 40 PVC

Type of backfill: Bentonite grout

Depth of top of seal: 14.3'

Type of seal: Granular bentonite

Depth of top of filter pack: 17.6'

Depth of top of screen: 24.1'

Type of filter pack: 12-20 sand

I.D./Type of screen: 2" dia. flush-joint slotted Sch. 40 PVC

Screen slot size: 0.01"

Depth of bottom of screen: 33.9'

Depth of bottom of plugged blank section: 34.4'

Type of backfill below well/pz: 12-20 sand

Depth of bottom of boring: 34.5'

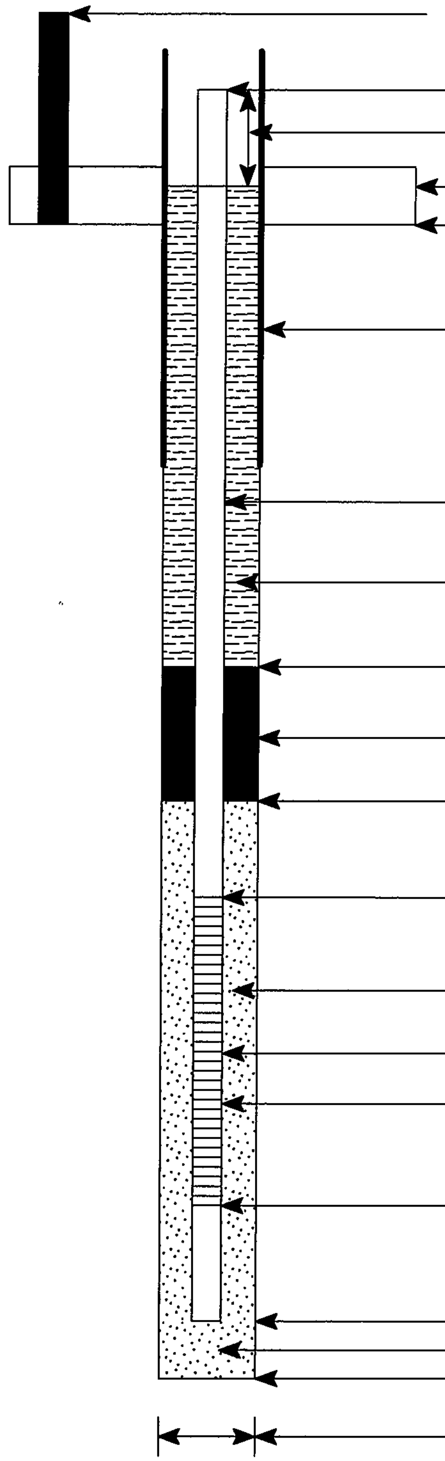
Diameter of boring: 8"

Note: Depths are in feet below grade.

PIEZOMETER REPORT

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
MW/PZ NO: P-508
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
INSTALLED BY: O'Malley Drilling
DATE: 7/2/2010
INSPECTED BY: R. Exceen
GRND ELEV: 890.65
METHOD OF INSTALLATION: Through HSA
NORTH: 643738.714
OBSERVATIONS:
EAST: 3110601.945

For detailed geologic descriptions see boring log: P-508



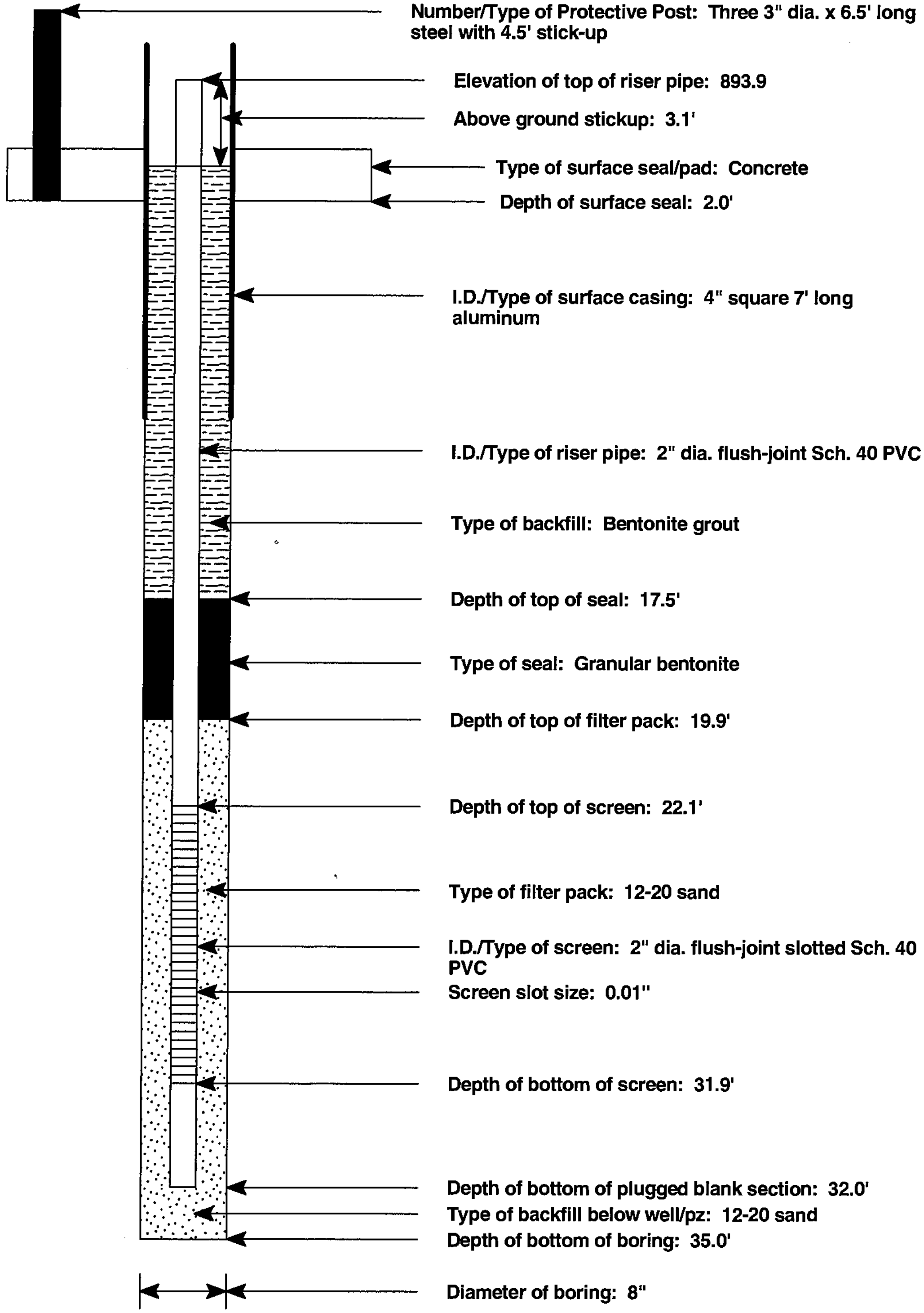
Note: Depths are in feet below grade.

URS

PIEZOMETER REPORT

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
MW/PZ NO: P-509
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
INSTALLED BY: O'Malley Drilling
DATE: 7/1/2010
INSPECTED BY: R. Exceen
GRND ELEV: 891.26
METHOD OF INSTALLATION: Through HSA
NORTH: 644660.594
OBSERVATIONS:
EAST: 3109219.013

For detailed geologic descriptions see boring log: P-509

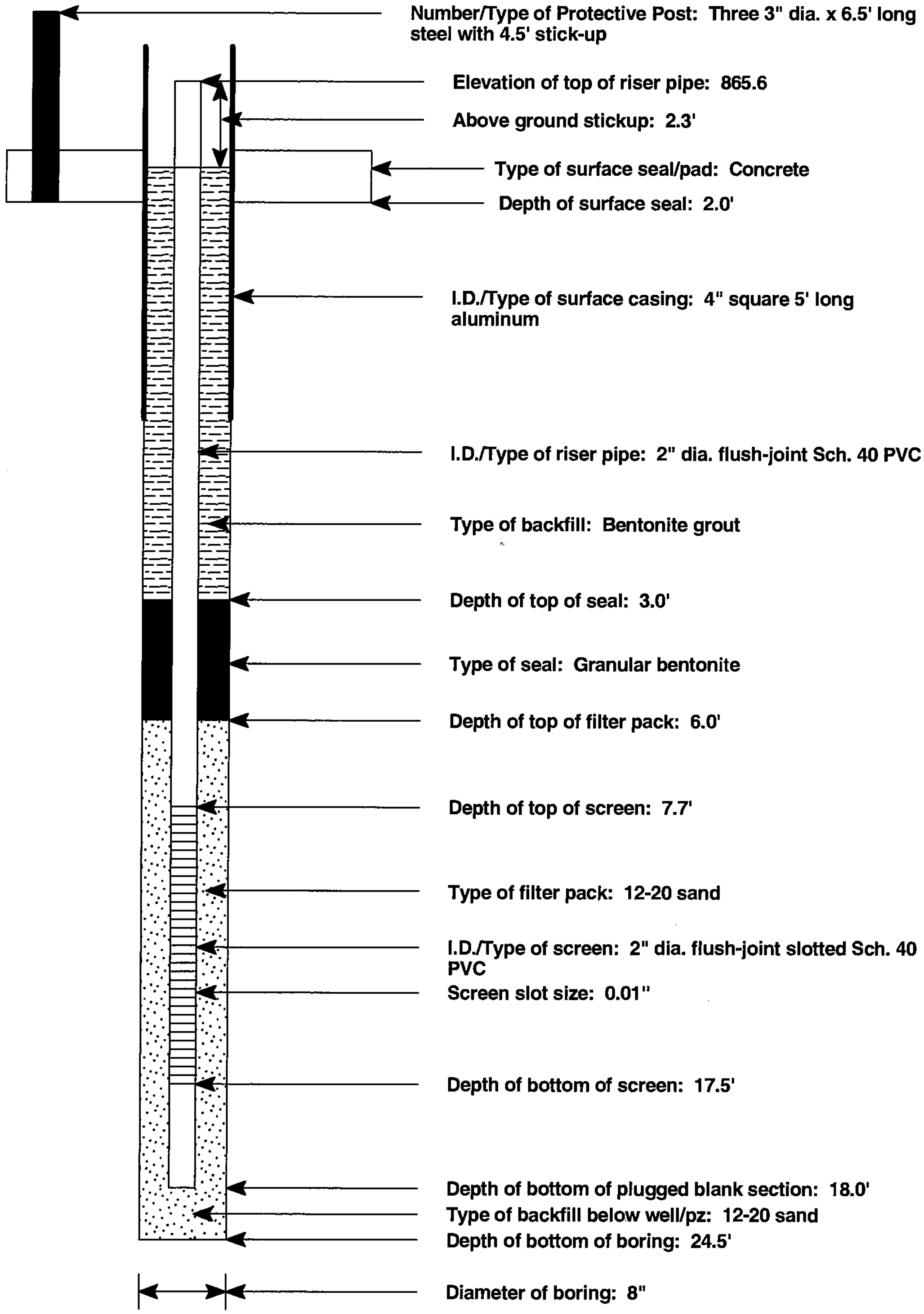


Note: Depths are in feet below grade.

PIEZOMETER REPORT

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
MW/PZ NO: P-601
PROJECT LOCATION: La Cygne, Kansas
PROJECT NO: 16530629
INSTALLED BY: O'Malley Drilling
DATE: 7/6/2010
INSPECTED BY: R. Exceen
GRND ELEV: 863.41
METHOD OF INSTALLATION: Through HSA
NORTH: 638847.533
OBSERVATIONS:
EAST: 3106462.735

For detailed geologic descriptions see boring log: P-601



Note: Depths are in feet below grade.

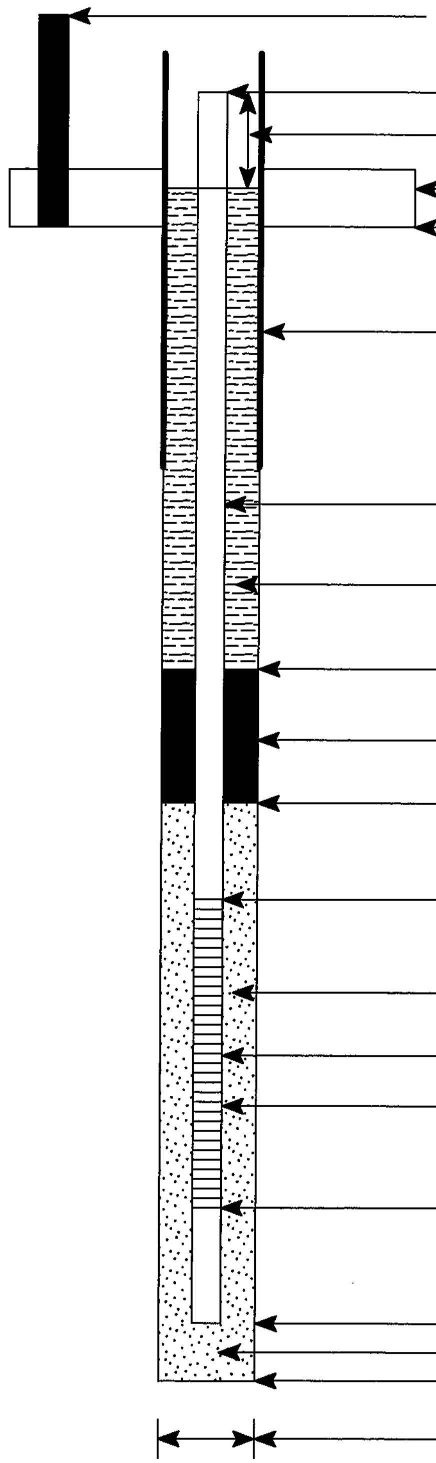
MW-PZ REPORT 16530629LACYGNE.GPJ OVP1.GDT 9/9/10

URS

PIEZOMETER REPORT

PROJECT NAME:	AQC Pond Geotechnical Investigation KCP&L La Cygne Station	MW/PZ NO:	P-602
PROJECT LOCATION:	La Cygne, Kansas	PROJECT NO:	16530629
INSTALLED BY:	O'Malley Drilling	DATE:	7/6/2010
INSPECTED BY:	R. Exceen	GRND ELEV:	863.43
METHOD OF INSTALLATION:	Through HSA	NORTH:	638112.093
OBSERVATIONS:		EAST:	3105660.281

For detailed geologic descriptions see boring log: P-602



Number/Type of Protective Post: Three 3" dia. x 6.5' long steel with 4.5' stick-up

Elevation of top of riser pipe: 865.9

Above ground stickup: 2.5'

Type of surface seal/pad: Concrete

Depth of surface seal: 2.0'

I.D./Type of surface casing: 4" square 5' long aluminum

I.D./Type of riser pipe: 2" dia. flush-joint Sch. 40 PVC

Type of backfill: Bentonite grout

Depth of top of seal: 8.9'

Type of seal: Granular bentonite

Depth of top of filter pack: 11.0'

Depth of top of screen: 14.0'

Type of filter pack: 12-20 sand

I.D./Type of screen: 2" dia. flush-joint slotted Sch. 40 PVC

Screen slot size: 0.01"

Depth of bottom of screen: 23.8'

Depth of bottom of plugged blank section: 23.9'

Type of backfill below well/pz: 12-20 sand

Depth of bottom of boring: 24.9'

Diameter of boring: 8"

Note: Depths are in feet below grade.

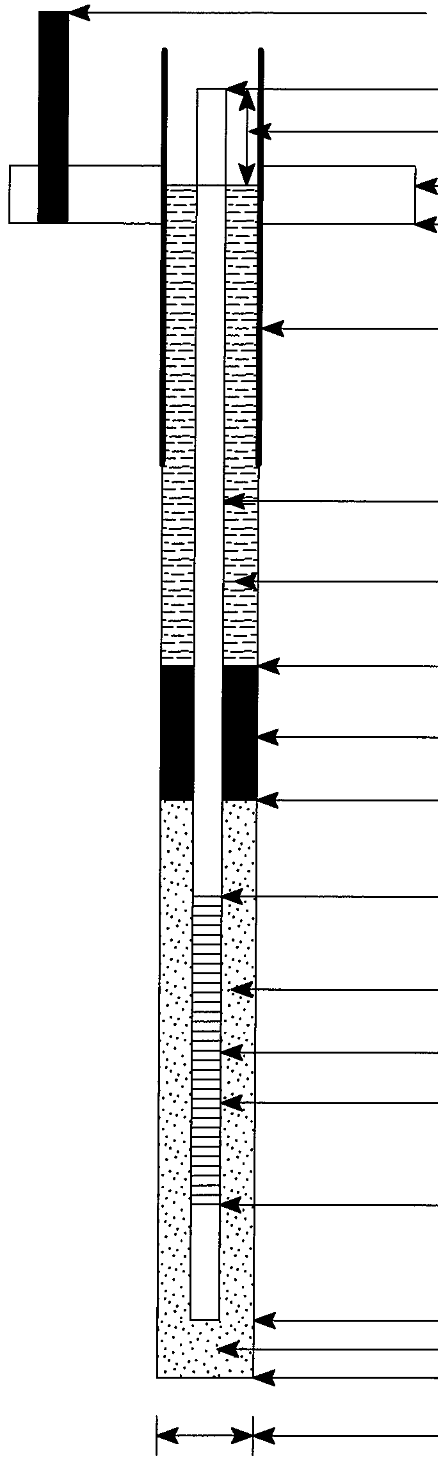
URS

PIEZOMETER REPORT

PROJECT NAME: AQC Pond Geotechnical Investigation KCP&L La Cygne Station
PROJECT LOCATION: La Cygne, Kansas
INSTALLED BY: O'Malley Drilling
INSPECTED BY: R. Exceen
METHOD OF INSTALLATION: Through HSA
OBSERVATIONS:

MW/PZ NO: P-603
PROJECT NO: 16530629
DATE: 7/7/2010
GRND ELEV: 863.65
NORTH: 637297.379
EAST: 3105790.537

For detailed geologic descriptions see boring log: P-603



Number/Type of Protective Post: Three 3" dia. x 6.5' long steel with 4.5' stick-up

Elevation of top of riser pipe: 865.0

Above ground stickup: 1.5'

Type of surface seal/pad: Concrete

Depth of surface seal: 2.0'

I.D./Type of surface casing: 4" square 5' long aluminum

I.D./Type of riser pipe: 2" dia. flush-joint Sch. 40 PVC

Type of backfill: Bentonite grout

Depth of top of seal: 3.0'

Type of seal: Granular bentonite

Depth of top of filter pack: 7.9'

Depth of top of screen: 9.8'

Type of filter pack: 12-20 sand

I.D./Type of screen: 2" dia. flush-joint slotted Sch. 40 PVC

Screen slot size: 0.01"

Depth of bottom of screen: 19.6'

Depth of bottom of plugged blank section: 20.1'

Type of backfill below well/pz: none

Depth of bottom of boring: 20.1'

Diameter of boring: 8"

Note: Depths are in feet below grade.

URS

SUMMARY OF LABORATORY TEST DATA

AQC POND GEOTECHNICAL INVESTIGATION
KCPL LA CYGNE STATION
LA CYGNE, KANSAS
16530626

			Classification Properties					Compaction		Permeability	Strength Properties	
											Unconfined	
Boring/Test Pit No.	Sample Depth, ft.	Unified Soil Class.	As Received Water Cont., %	Dry Unit Wt., pcf	Liquid Limit	Plastic Limit	% Pass. No. 200 or Fig No.	Max. Dry Unit Weight, pcf	Optimum Water Content, %	cm/sec @ 20° C	Comp. Strength, ksf (Qu)	Strain @ Failure, %
TP-501T	2.0-3.0	CH*	28.7		75	21	99.6					
TP-503SS	5.0-7.0	CH*	27.2		61	16						
TP-504SS	4.0-6.0	CH*	25.5		57	17						
	8.0-9.0	CH*	26.9		58	18						
TP-505SS	5.0-7.0	CH*	24.6		52	20	88.9					
TP-506T	4.5-5.0	SP-SM	10.9	(bottom ash)			5.8					
TP-507	2.0-3.0	CH*	24.8		61	19						
	6.0-7.0	SP		(bottom ash)			1.7					
TP-508T	1.0-2.0	CH*	23.4		64	18						
P-501	3.5-4.5	CH*	28.4	94.7								
	8.5-9.5	CH*	24.5	103.4								
	18.5-19.5	(W. Shale)*	18.9	111.6							7.8	5.0
	23.5-24.5	CH*	15.2	98.3	50	16					9.7	7.3
	33.5-34.5	CH	22.7	104.1	52	16					3.8	18.1
	38.5-39.5	CL	19.7	103.6	43	16					1.7	6.4
P-502	3.5-4.5	CL*	19.7	106.5								
	13.5-14.5	CL*	16.5	115.0								
	23.5-24.5	CH*	20.5	107.9								
	28.5-29.5	CH*	26.3				95.1					
	33.5-34.5	CH*	23.1	103.4								
	43.5-44.5	CH*	25.3	100.8	66	18					4.5	10.1

SUMMARY OF LABORATORY TEST DATA

AQC POND GEOTECHNICAL INVESTIGATION
KCPL LA CYGNE STATION
LA CYGNE, KANSAS
16530626

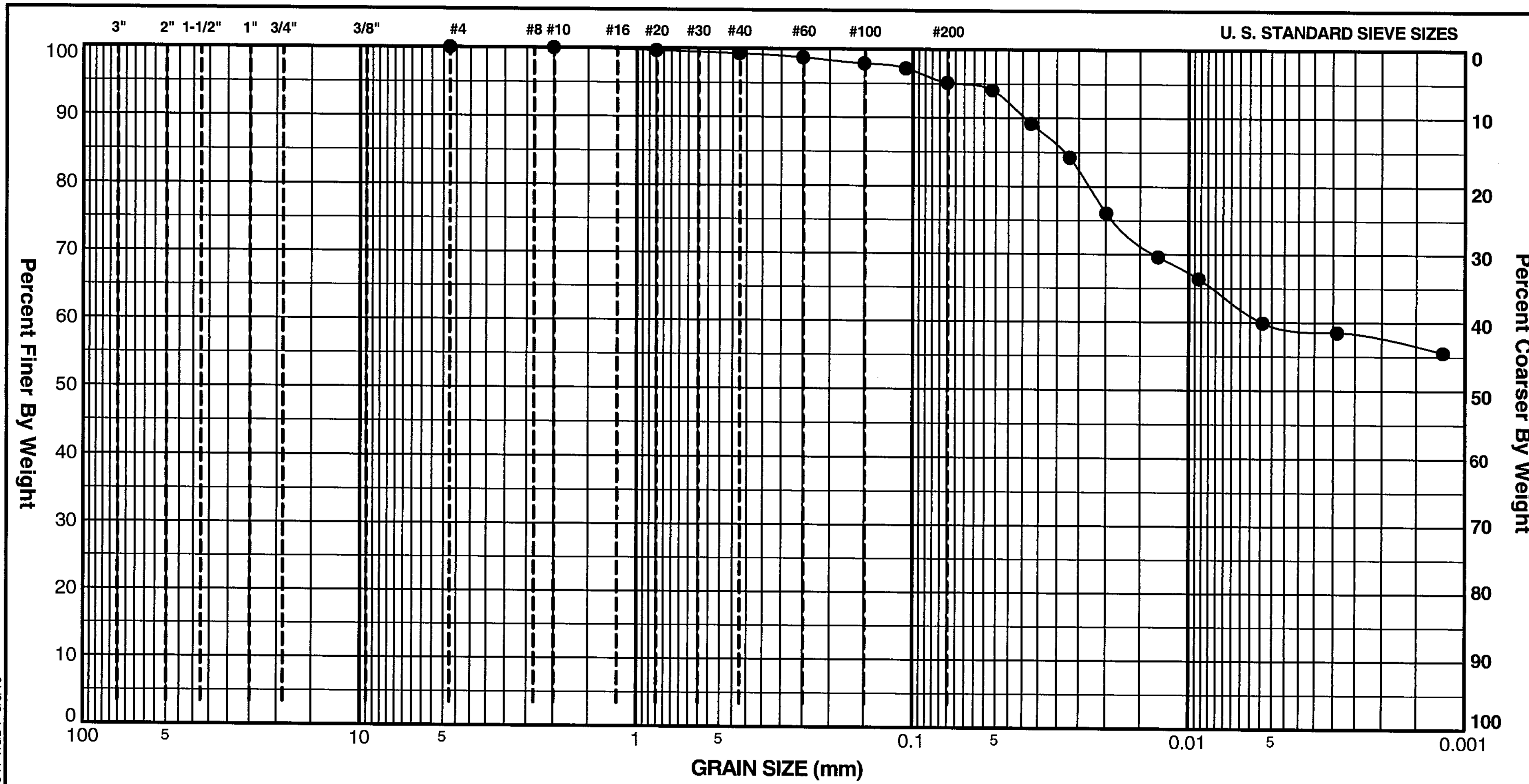
Boring/Test Pit No.	Sample Depth, ft.	Unified Soil Class.	Classification Properties					Compaction		Permeability	Strength Properties	
											Unconfined	
			As Received Water Cont., %	Dry Unit Wt., pcf	Liquid Limit	Plastic Limit	% Pass. No. 200 or Fig No.	Max. Dry Unit Weight, pcf	Optimum Water Content, %	cm/sec @ 20° C	Comp. Strength, ksf (Qu)	Strain @ Failure, %
P-502	53.5-54.5	CL/CH	22.5	104.9	49	15					5.3	18.0
	58.5-59.5	CH	25.37	101.7							1.7	21.0
P-503	3.5-4.5	CH*	26.5	97.8								
	8.5-9.5	CH*	25.9	98.9								
	18.5-19.5	CH*	19.9	108.7	57	18						
	23.5-24.5	CH*	18.8	110.9								
	38.5-39.5	CH	26.4	99.7	70	18					4.2	10.4
P-504	3.5-4.5	CH*	25.2	101.2								
	13.5-14.5	CH*	17.3	113.6								
	28.5-29.5	CH*	19.8	109.5								
	43.5-44.5	CH*	24.3	102.6	66	15						
P-505	8.5-9.5	CH*	26.1	98.7								
	18.5-19.5	CH*	21.0	107.1								
	28.5-29.5	CH*	19.5	104.8								
	53.5-54.5	(Shale)	16.0	118.5							10.4	7.2
P-506	3.5-4.5	CH*	27.8	96.3							2.7	10.2
	13.5-14.5	CH*	25.0	101.4							6.0	13.4
	23.5-24.5	CH*	18.6	111.7							2.8	10.1
	47.3-47.5	(Shale)	8.3		39	16						
P-507	3.5-4.5	CH*	24.3	102.8	60	14					3.8	14.1
	13.5-14.5	CH*	25.9	99.9	71	17					5.6	20.0
	23.5-24.5	CH	29.8	93.5							3.4	15.7
	28.5-29.5	CH*	24.7	100.0	67	18					4.0	10.3

SUMMARY OF LABORATORY TEST DATA

AQC POND GEOTECHNICAL INVESTIGATION
KCPL LA CYGNE STATION
LA CYGNE, KANSAS
16530626

			Classification Properties					Compaction		Permeability	Strength Properties	
											Unconfined	
Boring/Test Pit No.	Sample Depth, ft.	Unified Soil Class.	As Received Water Cont., %	Dry Unit Wt., pcf	Liquid Limit	Plastic Limit	% Pass. No. 200 or Fig No.	Max. Dry Unit Weight, pcf	Optimum Water Content, %	cm/sec @ 20° C	Comp. Strength, ksf (Qu)	Strain @ Failure, %
P-508	3.5-4.5	CH*	24.2	102.7	55	17					2.8	12.7
	13.5-14.5	CH*	24.5	103.3							6.6	6.3
	18.5-19.5	CH*	24.7	101.9							6.7	20.3
	23.5-24.5	(Shale)	15.6	116.5	41	17					8.4	5.1
P-509	3.5-4.5	CH*	26.8	98.2								
	8.5-9.5	CH*	26.3				89.8					
	13.5-14.5	CH*	21.6	107.7							3.0	5.0
	23.5-24.5	CL*	19.0	110.9	47	23					3.6	6.4
	28.5-29.5	CH	24.5	102.6								
P-601	3.5-4.5	CH*	29.2	94.8								
	9.5-10.0	CH	29.5	94.5	75	18					4.5	8.5
	14.5-15.0	CH	29.8	94.5							4.8	18.0
	18.0-19.0	CH	29.2	93.9	66	18					2.2	20.6
P-602	3.5-4.5	CH*	28.2									
	9.5-10.0	CH	24.2	102.2	68	14					4.7	13.0
	13.5-15.0	CH	20.2	106.9								
P-603	3.5-4.5	CH*	24.9	101.0	61	15						
	8.5-9.5	CH*	24.7	101.3								
	13.5-14.5	CH*	25.2	101.1								
	18.5-19.5	CH*	22.5	104.8								

*-Indicates that the soil sample is determined to be FILL based on the sample appearance in the laboratory, the drilling logs, and historical and site data.



COBBLES	GRAVEL		SAND			SILT	CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE		

SYMBOL	BORING NO.	DEPTH (feet)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_u	C_c	LL	PL	PI	% Gravel	% Sand	% Silt	% Clay	SAMPLE DESCRIPTION
●	P-502	28.5'-29.5'	0.028	0.005										0.0	4.9	37.8	57.3	FAT CLAY CH

URS CORPORATION
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

URS

AQC Pond Geotechnical Investigation KCP&L La Cygne Station

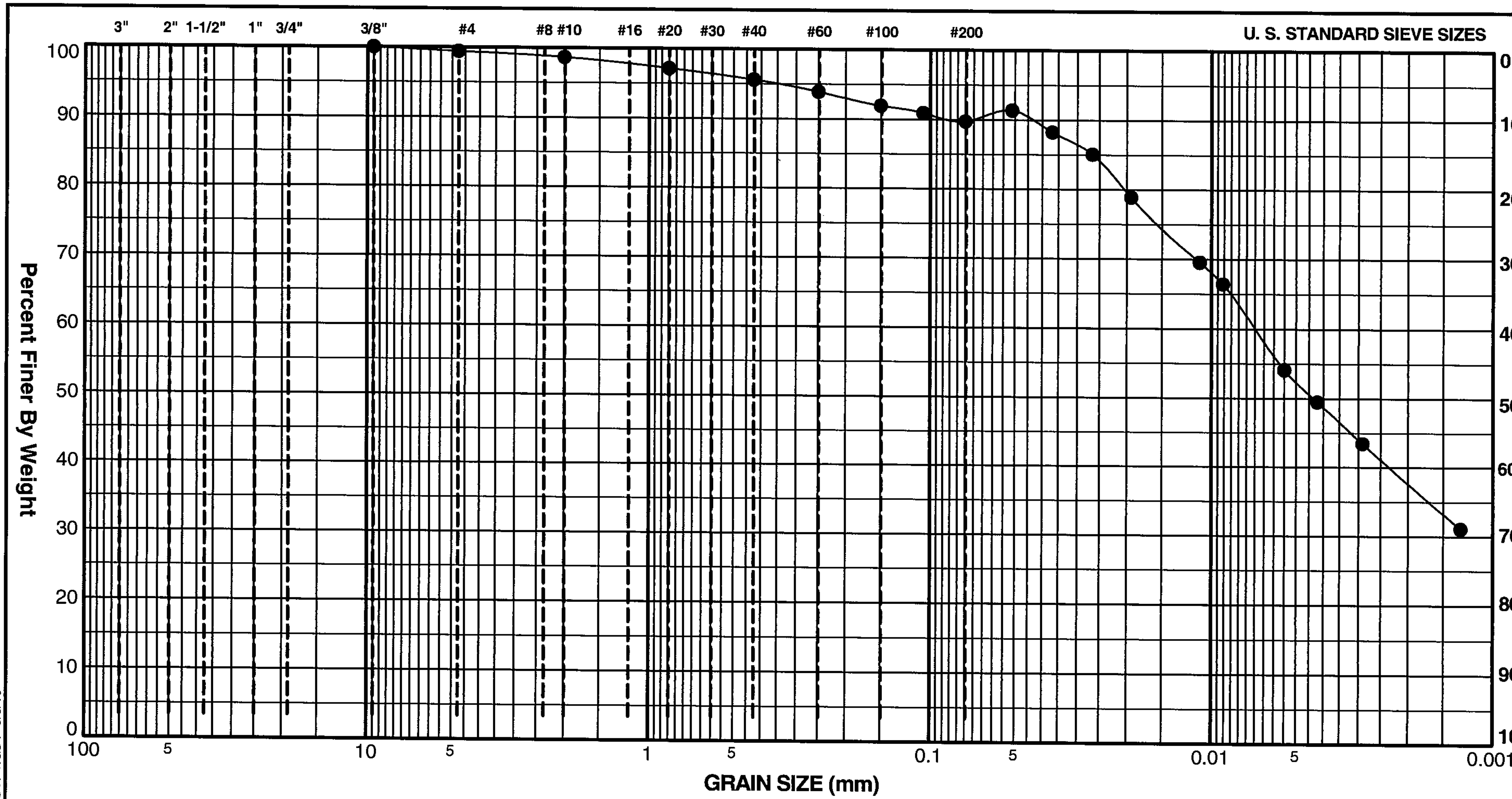
La Cygne, Kansas
GRADATION CURVES

Checked By: BD

Date: 9/3/2010

Proj. No.16530629

OVP GRAIN SIZE TO 3 INCHES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10



COBBLES	GRAVEL		SAND			SILT	CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE		

SYMBOL	BORING NO.	DEPTH (feet)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_u	C_c	LL	PL	PI	% Gravel	% Sand	% Silt	% Clay	SAMPLE DESCRIPTION
●	P-509	8.5'-9.5'	0.026	0.007	0.004									0.6	9.7	52.0	37.7	FAT CLAY CH

URS CORPORATION
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

URS

AQC Pond Geotechnical Investigation KCP&L La Cygne Station

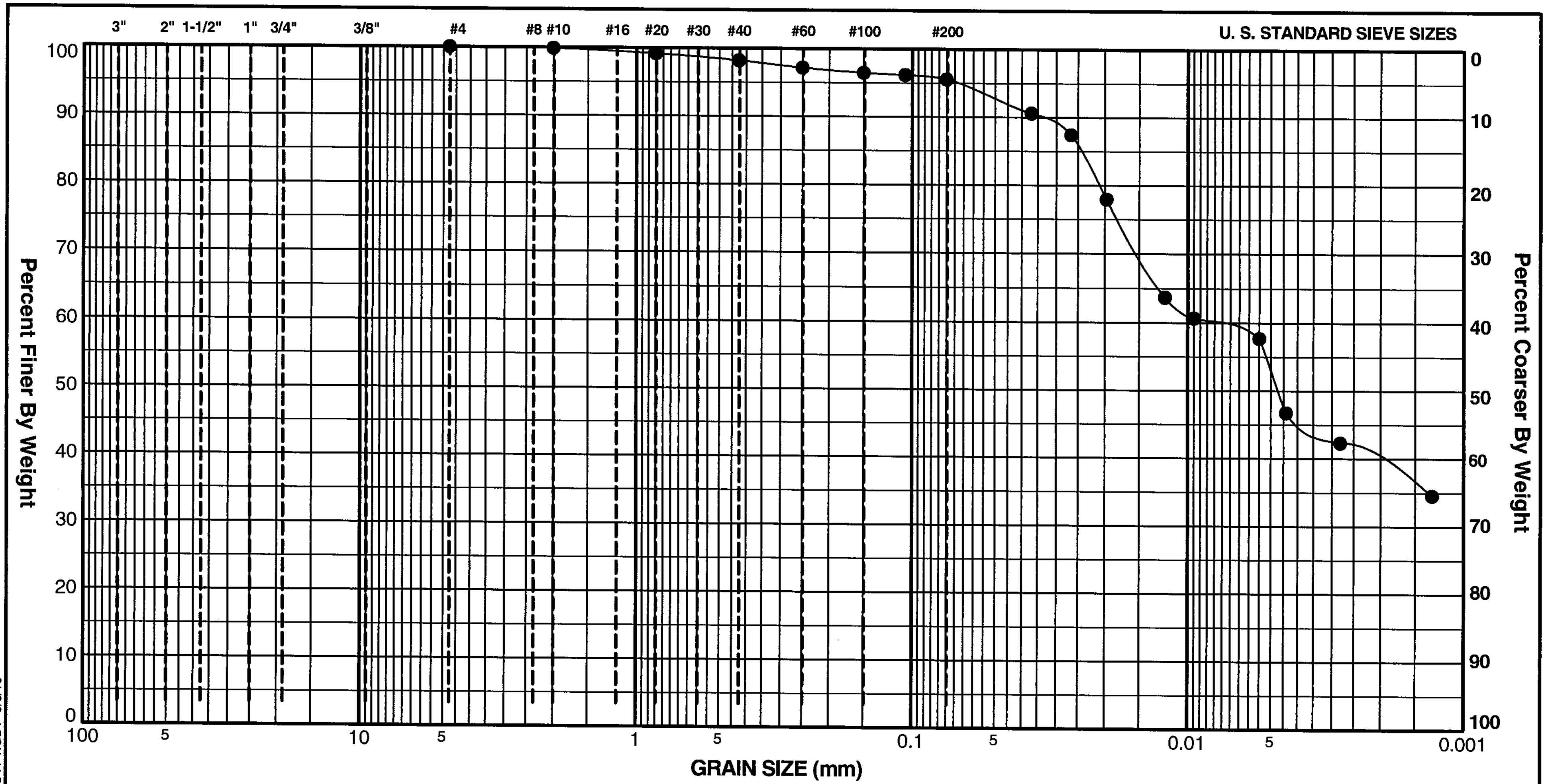
La Cygne, Kansas
GRADATION CURVES

Checked By: BD

Date: 9/3/2010

Proj. No.16530629

OVP GRAIN SIZE TO 3 INCHES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10



COBBLES	GRAVEL		SAND			SILT	CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE		

SYMBOL	BORING NO.	DEPTH (feet)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_u	C_c	LL	PL	PI	% Gravel	% Sand	% Silt	% Clay	SAMPLE DESCRIPTION
●	TP-501T	2.0'-3.0'	0.025	0.008	0.005						75	21	54	0.0	4.5	56.7	38.9	FAT CLAY CH

URS CORPORATION
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

AQC Pond Geotechnical Investigation KCP&L La Cygne Station

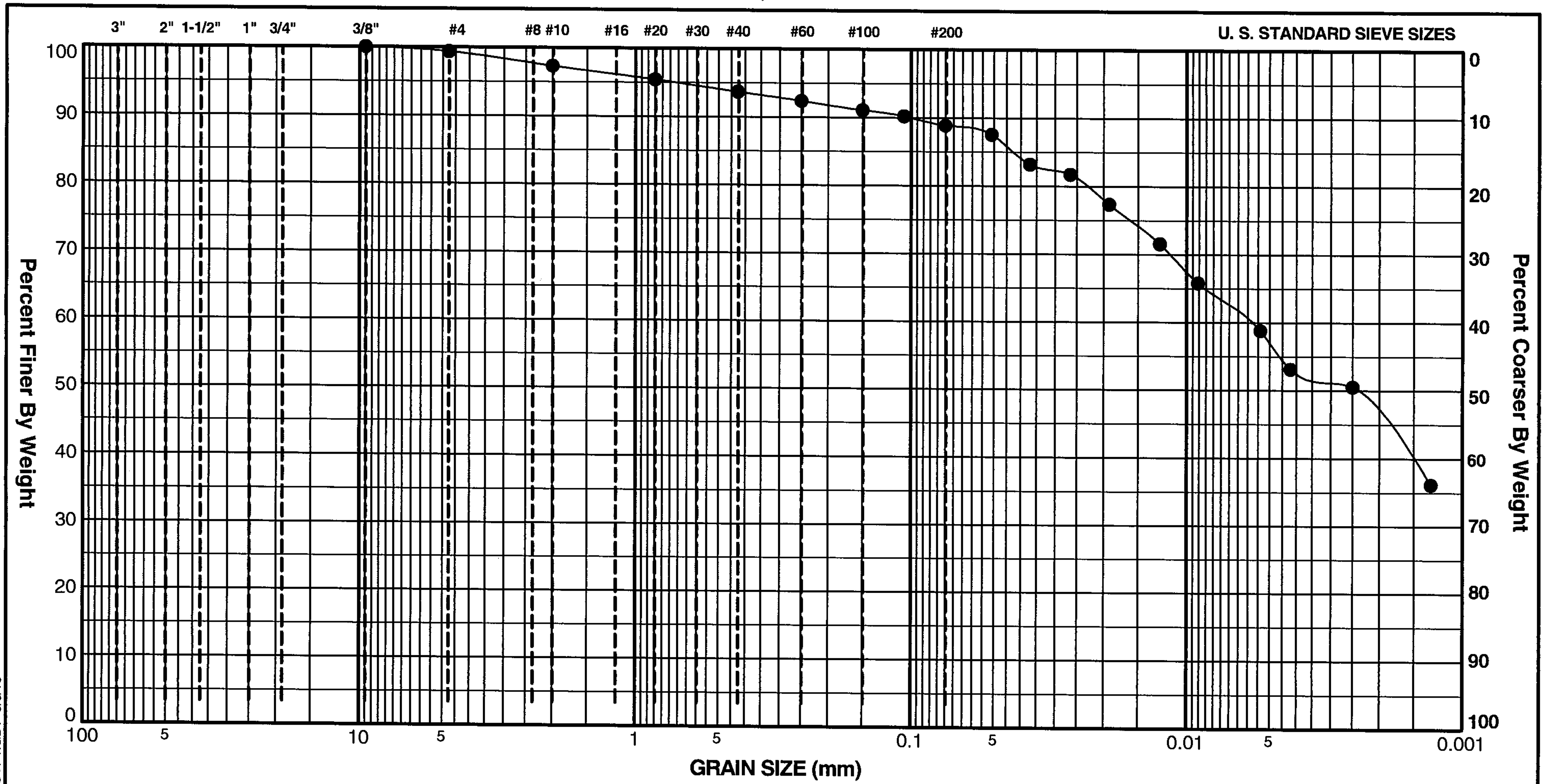
La Cygne, Kansas
GRADATION CURVES

Checked By: BDQ

Date: 9/3/2010

Proj. No.16530629

OVP GRAIN SIZE TO 3 INCHES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10



COBBLES	GRAVEL		SAND			SILT	CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE		

SYMBOL	BORING NO.	DEPTH (feet)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_u	C_c	LL	PL	PI	% Gravel	% Sand	% Silt	% Clay	SAMPLE DESCRIPTION
●	TP-505SS	5.0'-7.0'	0.042	0.006	0.002						52	20	32	0.6	10.5	43.2	45.6	FAT CLAY CH

URS CORPORATION
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

URS

AQC Pond Geotechnical Investigation KCP&L La Cygne Station

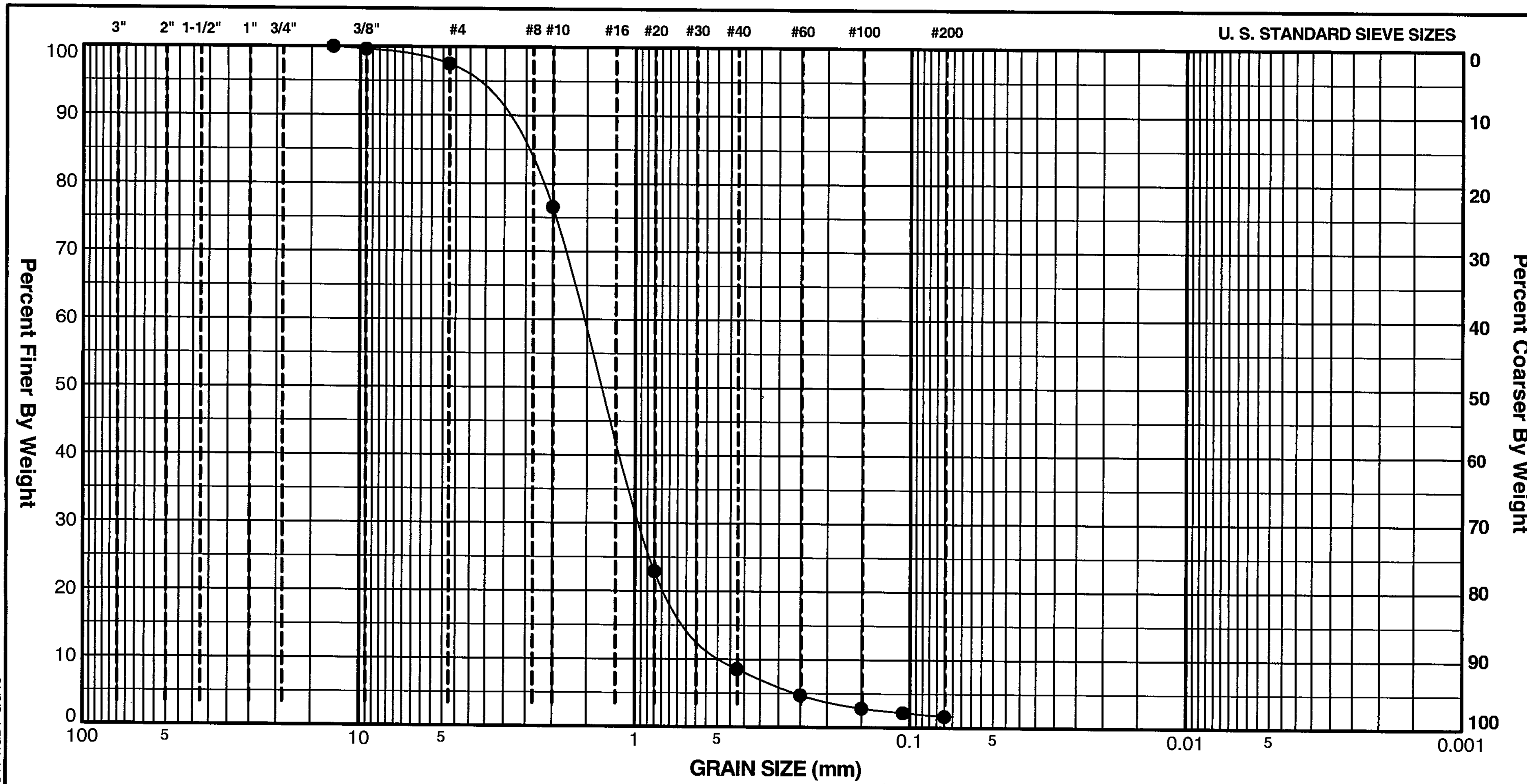
La Cygne, Kansas
GRADATION CURVES

Checked By: BR

Date: 9/3/2010

Proj. No.16530629

OVP GRAIN SIZE TO 3 INCHES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10



COBBLES	GRAVEL		SAND			SILT	CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE		

SYMBOL	BORING NO.	DEPTH (feet)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_u	C_c	LL	PL	PI	% Gravel	% Sand	% Silt	% Clay	SAMPLE DESCRIPTION
●	TP-507	6.0'-7.0'	2.835	1.536	1.309	0.952	0.580	0.456	3.37	1.29				2.5	95.8	1.7		POORLY GRADED SAND SP

URS CORPORATION
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

AQC Pond Geotechnical Investigation KCP&L La Cygne Station

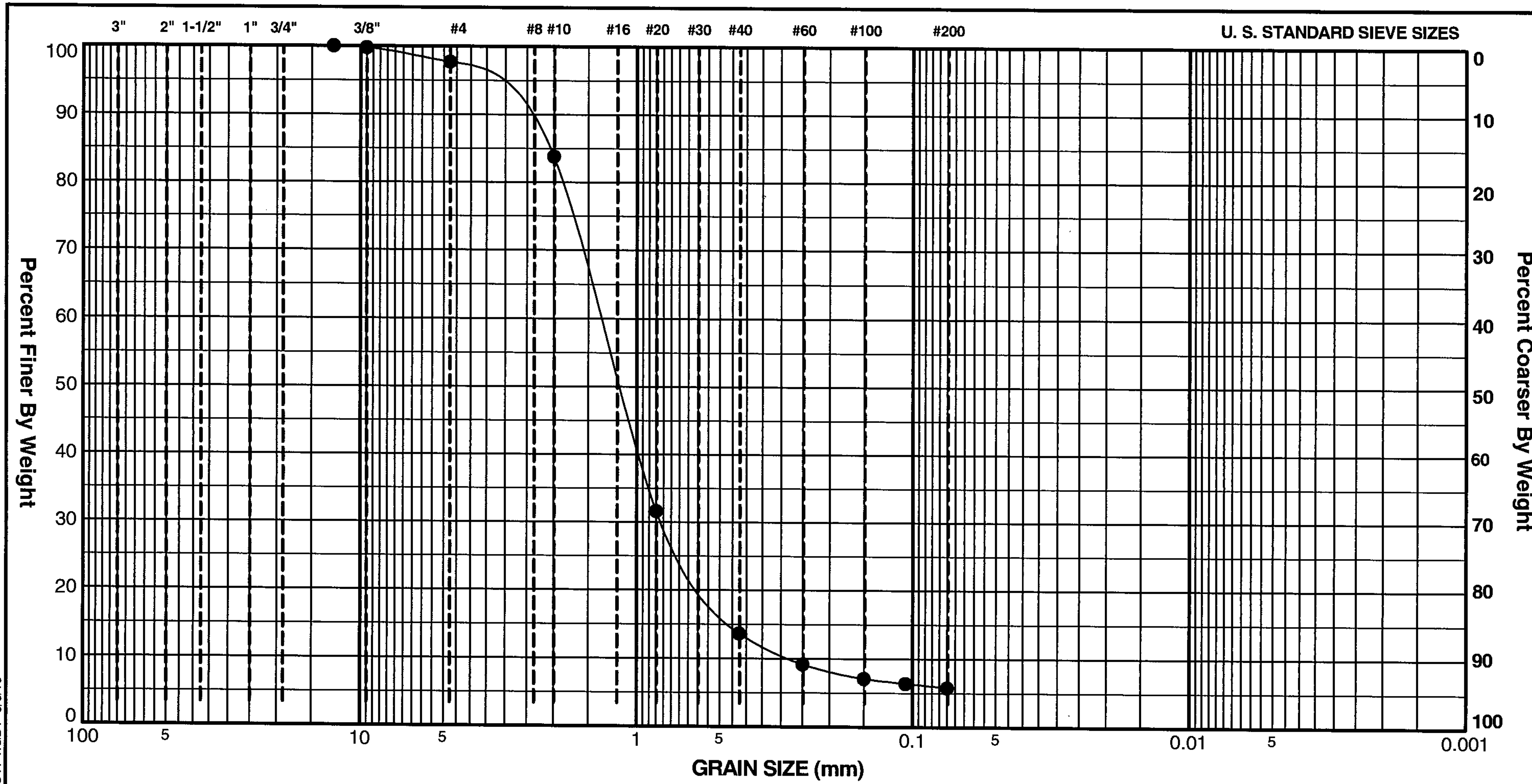
La Cygne, Kansas
GRADATION CURVES

Checked By: BDC

Date: 9/3/2010

Proj. No.16530629

OVP GRAIN SIZE TO 3 INCHES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10



COBBLES	GRAVEL		SAND			SILT	CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE		

SYMBOL	BORING NO.	DEPTH (feet)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_u	C_c	LL	PL	PI	% Gravel	% Sand	% Silt	% Clay	SAMPLE DESCRIPTION
●	TP-506T	4.5'-5.0'	2.153	1.354	1.149	0.799	0.448	0.276	4.90	1.71	NP	NP	NP	2.3	91.9	5.8		POORLY GRADED SAND with SILT SP-SM

URS CORPORATION
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

URS

AQC Pond Geotechnical Investigation KCP&L La Cygne Station

La Cygne, Kansas
GRADATION CURVES

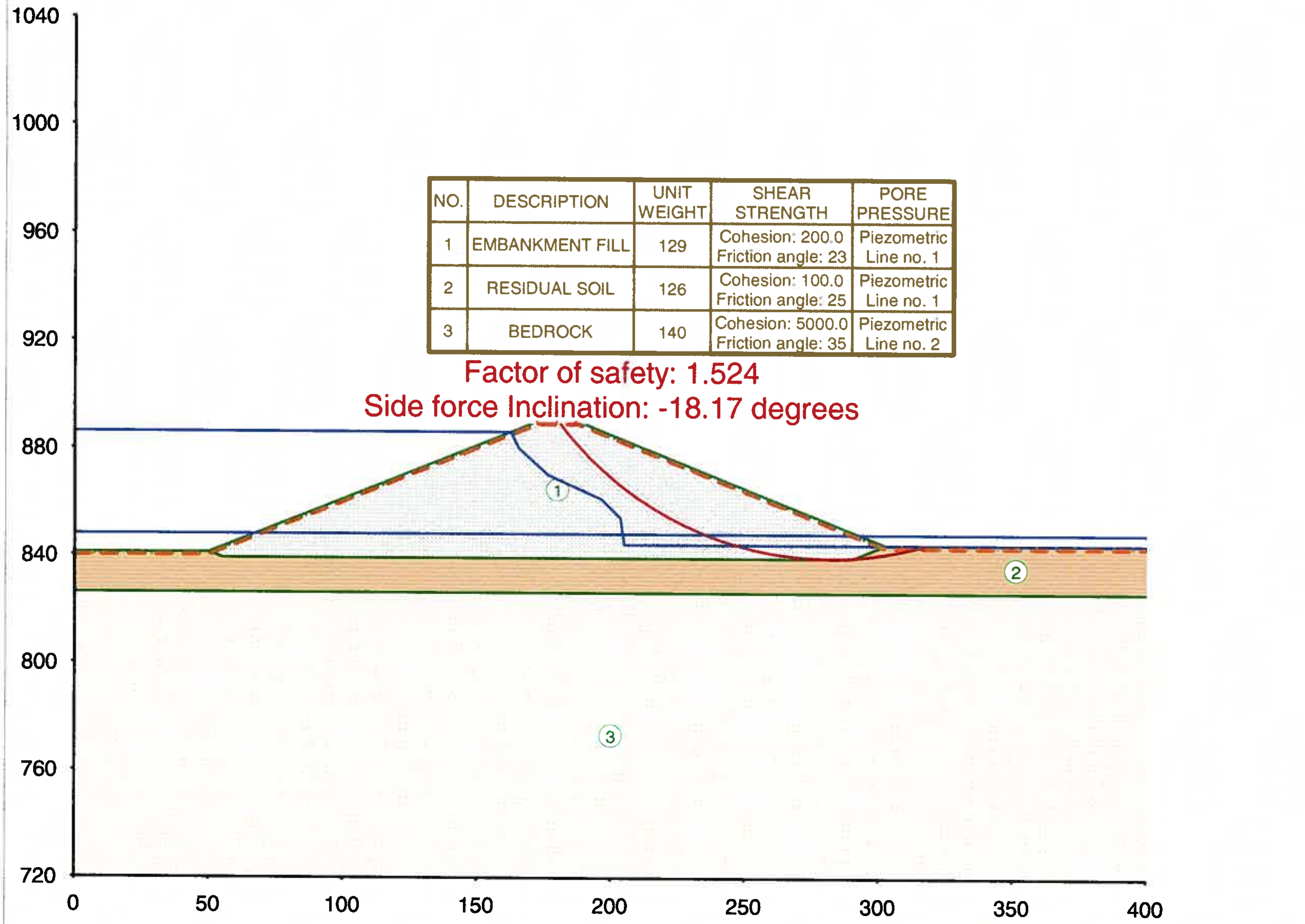
Checked By: BD Q

Date: 9/3/2010

Proj. No.16530629

OVP GRAIN SIZE TO 3 INCHES 16530629LACYGNE.GPJ OVP1.GDT 9/3/10

KCPL LA CYGNE UPPER AQC POND, SECTION P-502



Date: Tue Sep (Filename: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.UT4Time: 15:23:36

```
TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.0.1.5 - Last Revision Date: 2/15/2003
(C) Copyright 1985-2002 S. G. Wright - All rights reserved
*******************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE           *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE         *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA        *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE  *
* READ ALL DOCUMENTATION FOR THIS SOFTWARE BEFORE ATTEMPTING      *
* TO USE IT.  NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT      *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR       *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS       *
* OR ADAPTABILITY OF THIS SOFTWARE.                               *
*******************************************************************
□
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 3
*************************
* NEW PROFILE LINE DATA *
*************************

-----------------------------------------------------------
----- Profile Line No. 1 - Material Type (Number): 1 -----
-----------------------------------------------------------
Description: EMBANKMENT FILL

Point         X           Y

   1        50.00      841.00
   2       162.50      886.00
   3       172.50      890.00
   4       187.50      890.00
   5       302.50      844.00

-----------------------------------------------------------
----- Profile Line No. 2 - Material Type (Number): 2 -----
-----------------------------------------------------------
Description: RESIDUAL SOIL

Point         X           Y

   1         0.00      841.00
   2        50.00      841.00
   3        55.00      839.00
   4       290.00      839.00
   5       302.50      844.00
   6       400.00      844.00

-----------------------------------------------------------
----- Profile Line No. 3 - Material Type (Number): 3 -----
-----------------------------------------------------------
Description: BEDROCK
```

```
Point        X          Y

   1       0.00      826.00
   2     400.00      826.00
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 4

```
**********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
-------------------------------------------------------------------
Description: EMBANKMENT FILL

Unit weight of soil (material): 129.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 200.0
Friction angle - - - - - 23.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
-------------------------------------------------------------------
Description: RESIDUAL SOIL

Unit weight of soil (material): 126.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 100.0
Friction angle - - - - - 25.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
-------------------------------------------------------------------
Description: BEDROCK

Unit weight of soil (material): 140.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 5000.0
Friction angle - - - - - 35.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 2
```

Negative pore water pressures are NOT allowed - set to zero.

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 6
****
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
****

--------------- Piezometric Line Number 1 ---------------

Description: PIEZOMETRIC LINE FOR EMBANKMENT
Unit weight of fluid (water): 62.4

Point	X	Y
1	0.00	886.00
2	162.50	886.00
3	165.50	880.00
4	176.50	870.00
5	196.50	861.00
6	203.50	854.00
7	205.00	844.00
8	307.50	844.00
9	400.00	844.00

--------------- Piezometric Line Number 2 ---------------

Description: BEDROCK
Unit weight of fluid (water): 62.4

Point	X	Y
1	0.00	848.00
2	400.00	848.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 11
****
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
****

Point	X	Y	Normal Pressure	Shear Stress

Distributed loads will be generated from piezometric line number 1
See Output Table number 27

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 16
```
**********************************
* NEW ANALYSIS/COMPUTATION DATA *
**********************************
```

Starting Center Coordinate for Search at -
X: 276.00
Y: 945.00

Required accuracy for critical center
(= minimum spacing between grid points): 1.000

No center allowed to pass below: 900.00

Critical shear surface not allowed to pass below Y: 839.00
For the initial mode of search circles are tangent to horizontal line at -
Y: 839.00
Radius: 106.00

Depth of crack: 1.000

Depth of water (or other fluid) in crack: 1.000
Automatic search output will be in short form.
Procedure of Analysis: Spencer

The following represent default values or values that were prevously defined:
Subtended angle for slice subdivision: 3.00(degrees)
Conventional (single-stage) computations will be performed.
Seismic coefficient: 0.000
Unit weight of water (or other fluid) in crack: 62.4
Search will be continued after the initial mode to find a most critical circle.
Maximum number of trial grids for a given search mode: 50
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Standard sign convention used for direction of shear stress on shear surface.
Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
Minimum weight required for computations to be performed: 100
Initial trial factor of safety: 3.000
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure: -10.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 26
****
* NEW, COMPUTED SLOPE GEOMETRY DATA *
****

These slope geometry were generated from the Profile Lines.

Point	X	Y
1	0.00	841.00
2	50.00	841.00
3	55.00	843.00
4	162.50	886.00
5	172.50	890.00
6	187.50	890.00
7	290.00	849.00
8	302.50	844.00
9	400.00	844.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 27
****
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
****

Point	X	Y	Normal Pressure	Shear Stress
1	0.00	841.00	2808.0	0.0
2	50.00	841.00	2808.0	0.0
3	55.00	843.00	2683.2	0.0
4	162.50	886.00	0.0	0.0

The above data were generated automatically from piezometric line number 1.

UTEXAS WARNING NUMBER 4240
Possible artesian pressures detected at x = 302.50
from piezometric line number 2 (Stage 1).

UTEXAS WARNING NUMBER 4240
Possible artesian pressures detected at x = 307.50
from piezometric line number 2 (Stage 1).

UTEXAS WARNING NUMBER 4240
Possible artesian pressures detected at x = 400.00
from piezometric line number 2 (Stage 1).

Search will be conducted for RIGHT face of slope

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS

```
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 32
***************************************************************
* SHORT-FORM OUTPUT FOR TYPE 1 AUTOMATIC SEARCH WITH CIRCLES *
***************************************************************

                          Center Coordinates of                1-Stage
                             Critical Circle                   Factor   Side
                                                                 of     Force
Mode of Search                   X          Y         Radius   Safety  Inclin.
   Messages


Circles tangent to horiz.     282.00     966.00     127.000     1.524  -18.17
line at Y = 839.00


Circles all have the same     282.00     966.00     127.000     1.524  -18.17
radius = 127.000


*************************************************************
CAUTION - THE FACTOR OF SAFETY COULD NOT BE COMPUTED
FOR SOME OF THE GRID POINTS AROUND THE MINIMUM
*************************************************************
```

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 33
********************************************
* 1-STAGE FINAL CRITICAL CIRCLE INFORMATION *
********************************************

CAUTION - THE FACTOR OF SAFETY COULD NOT BE COMPUTED
FOR SOME OF THE GRID POINTS AROUND THE MINIMUM
X Coordinate of Center . . . . . . . . . . . . .  282.00
Y Coordinate of Center . . . . . . . . . . . . .  966.00
Radius . . . . . . . . . . . . . . . . . . . . .  127.00
Factor of Safety . . . . . . . . . . . . . . . . 1.524
Side Force Inclination (degrees) . . . . . . . . -18.17
Number of Circles Tried  . . . . . . . . . . . .  84
Number of Circles F Calculated for . . . . . . .  70
Time Required for Search (seconds) . . . . . . .  0.0
```

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-502.dat
```

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 43

```
***************************************************************
* Coordinate, Weight, Strength and Pore Water Pressure        *
* Information for Individual Slices for Conventional          *
* Computations or First Stage of Multi-Stage Computations.    *
* (Information is for the critical shear surface in the       *
* case of an automatic search.)                               *
***************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. No.	Cohesion	Friction Angle	Pore Pressure
	181.00	889.00					
1	183.09	886.41	1930	1	200.0	23.00	0.0
	185.17	883.82					
2	186.34	882.49	2255	1	200.0	23.00	0.0
	187.50	881.15					
3	189.78	878.74	6099	1	200.0	23.00	0.0
	192.07	876.33					
4	194.28	874.21	7473	1	200.0	23.00	0.0
	196.50	872.09					
5	199.02	869.92	10045	1	200.0	23.00	0.0
	201.53	867.75					
6	202.52	866.96	4325	1	200.0	23.00	0.0
	203.50	866.17					
7	204.25	865.59	3428	1	200.0	23.00	0.0
	205.00	865.00					
8	207.70	863.06	13118	1	200.0	23.00	0.0
	210.39	861.11					
9	213.18	859.31	14714	1	200.0	23.00	0.0
	215.98	857.51					
10	218.86	855.86	16072	1	200.0	23.00	0.0
	221.75	854.20					
11	224.71	852.70	17155	1	200.0	23.00	0.0
	227.68	851.20					
12	230.72	849.86	17930	1	200.0	23.00	0.0
	233.76	848.52					
13	234.40	848.26	3793	1	200.0	23.00	0.0
	235.04	848.00					
14	238.16	846.85	18420	1	200.0	23.00	0.0
	241.28	845.70					
15	244.00	844.85	15803	1	200.0	23.00	0.0
	246.72	844.00					
16	249.93	843.16	18147	1	200.0	23.00	52.4
	253.15	842.32					
17	256.40	841.65	17464	1	200.0	23.00	146.6
	259.66	840.98					
18	262.95	840.48	16400	1	200.0	23.00	219.6
	266.23	839.98					
19	269.54	839.66	14960	1	200.0	23.00	271.1
	272.85	839.33					
20	276.17	839.18	13155	1	200.0	23.00	300.9
	279.49	839.02					
21	280.75	839.01	4426	1	200.0	23.00	311.2
	282.00	839.00					
22	285.32	839.09	10104	1	200.0	23.00	306.6
	288.65	839.17					
23	289.32	839.21	1756	1	200.0	23.00	298.7
	290.00	839.25					
24	290.38	839.28	933	1	200.0	23.00	294.7
	290.76	839.30					

```
 25    294.06    839.62            6602    2       100.0     25.00           273.4
       297.37    839.93
 26    299.94    840.30            3083    2       100.0     25.00           230.9
       302.50    840.67
 27    305.00    841.13            1811    2       100.0     25.00           179.3
       307.50    841.59
 28    310.74    842.34            1355    2       100.0     25.00           103.7
       313.98    843.09
 29    315.63    843.55             189    2       100.0     25.00            28.3
       317.28    844.00
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 44

```
*********************************************************
* Seismic Forces and Forces Due to Distributed Loads for *
* Individual Slices for Conventional Computations or the *
* First Stage of Multi-Stage Computations.               *
* (Information is for the critical shear surface in the  *
* case of an automatic search.)                          *
*********************************************************
```

There are no seismic forces or forces due to distributed loads
for the current shear surface

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 47

```
*************************************************************
*  Information for the Iterative Solution for the Factor of  *
*  Safety and Side Force Inclination by Spencer's Procedure  *
*************************************************************
```

Allowable force imbalance for convergence: 3
Allowable moment imbalance for convergence: 633

```
        Trial     Trial
        Factor   Side Force    Force       Moment                     Delta
Iter-    of     Inclination  Imbalance    Imbalance     Delta-F       Theta
ation  Safety    (degrees)     (lbs.)     (ft.-lbs.)                (degrees)

   1   3.00000   -17.1887  -4.406e+004   3.899e+007
First-order corrections to F and Theta ............     -2.9098     -0.6623
Reduced values - Deltas were too large ............     -0.5000     -0.1138

   2   2.50000   -17.3025  -3.499e+004   3.096e+007
First-order corrections to F and Theta ............     -1.6063     -0.6267
Reduced values - Deltas were too large ............     -0.5000     -0.1951

   3   2.00000   -17.4976  -2.139e+004   1.894e+007
```

```
First-order corrections to F and Theta ............   -0.6279    -0.5414
Reduced values - Deltas were too large ............   -0.5000    -0.4311

   4   1.50000   -17.9287   1.321e+003  -1.158e+006
First-order corrections to F and Theta ............    0.0234    -0.2481
Second-order corrections to F and Theta ...........    0.0237    -0.2434

   5   1.52368   -18.1722  -3.100e-001   2.661e+002
First-order corrections to F and Theta ............   -0.0000     0.0002
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 55

```
*********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)      *
*********************************************************************
```

Summation of Horizontal Forces: 1.49960e-011

Summation of Vertical Forces: 5.34328e-012

Summation of Moments: 1.23185e-003

Mohr Coulomb Shear Force/Shear Strength Check Summation: 7.78755e-012

***** CAUTION ***** Some of the Forces Between Slices Act at Points
Above the Surface of the Slope or Below the Shear Surface -
Either a Tension Crack may be Needed or the SOLUTION MAY NOT
BE A VALID SOLUTION

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 58

```
*************************************************************************
* Final Results for Stresses Along the Shear Surface                    *
* (Results are for the critical shear surface in the case of a search.) *
*************************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.524 Side Force Inclination: -18.17

-------- VALUES AT CENTER OF BASE OF SLICE --------

Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	183.09	886.41	204.9	204.9	188.3
2	186.34	882.49	537.4	537.4	281.0

3	189.78	878.74	799.5	799.5	354.0
4	194.28	874.21	1078.1	1078.1	431.6
5	199.02	869.92	1344.3	1344.3	505.8
6	202.52	866.96	1530.3	1530.3	557.6
7	204.25	865.59	1615.3	1615.3	581.3
8	207.70	863.06	1768.6	1768.6	624.0
9	213.18	859.31	1993.8	1993.8	686.7
10	218.86	855.86	2192.0	2192.0	741.9
11	224.71	852.70	2359.6	2359.6	788.6
12	230.72	849.86	2493.0	2493.0	825.8
13	234.40	848.26	2560.5	2560.5	844.6
14	238.16	846.85	2603.5	2603.5	856.6
15	244.00	844.85	2648.7	2648.7	869.1
16	249.93	843.16	2651.1	2598.7	855.2
17	256.40	841.65	2605.5	2458.9	816.3
18	262.95	840.48	2505.5	2285.9	768.1
19	269.54	839.66	2348.0	2076.9	709.9
20	276.17	839.18	2129.3	1828.4	640.6
21	280.75	839.01	1946.4	1635.2	586.8
22	285.32	839.09	1721.1	1414.5	525.3
23	289.32	839.21	1506.5	1207.8	467.7
24	290.38	839.28	1444.1	1149.4	451.5
25	294.06	839.62	1179.8	906.4	343.0
26	299.94	840.30	740.6	509.7	221.6
27	305.00	841.13	469.7	290.4	154.5
28	310.74	842.34	303.5	199.9	126.8
29	315.63	843.55	126.3	97.9	95.6

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:36:45 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-502.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-502
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

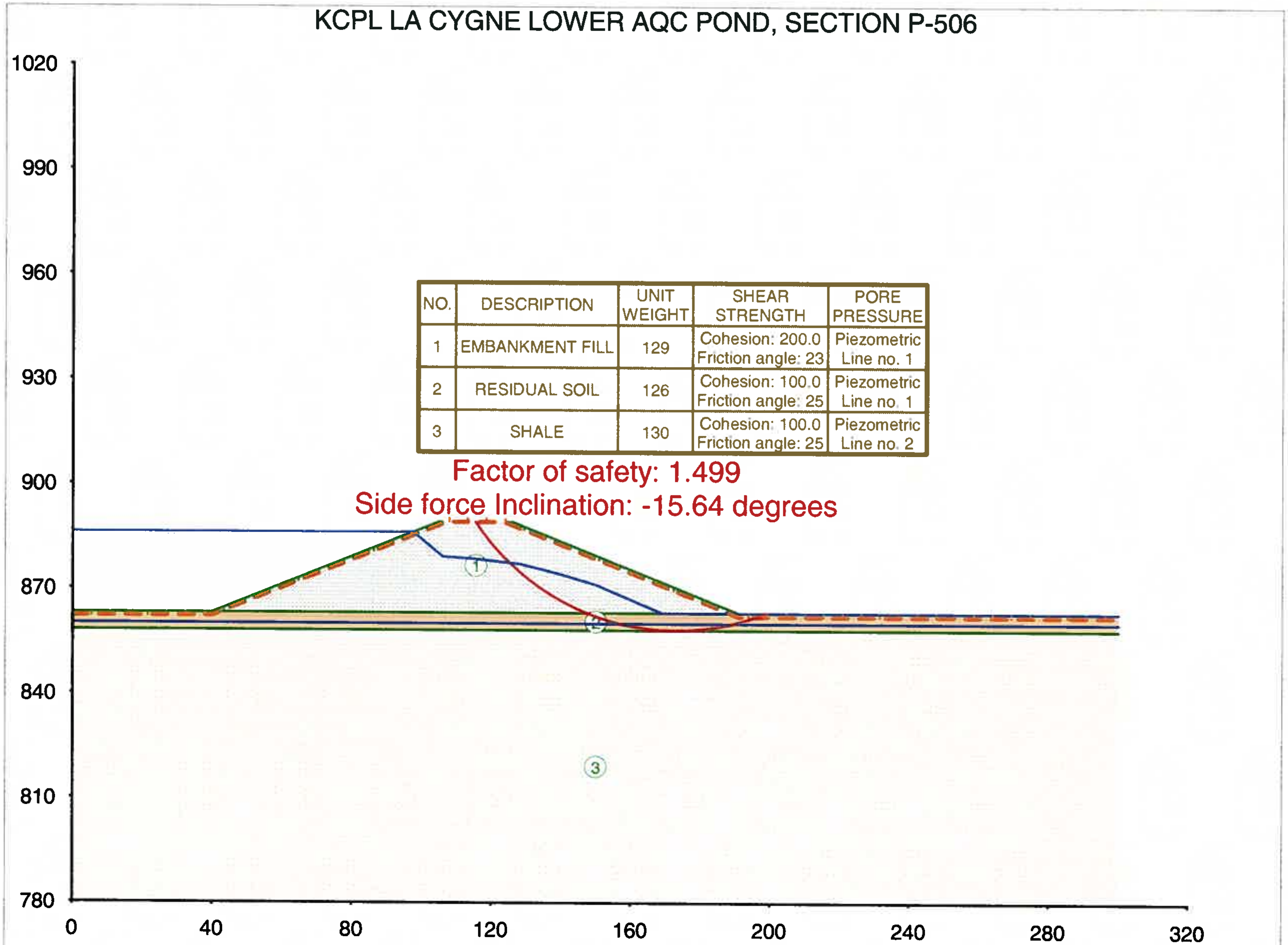
TABLE NO. 59
```
***************************************************************************
* Final Results for Side Forces and Stresses Between Slices              *
* (Results are for the critical shear surface in the case of a search.) *
***************************************************************************
```

--------------- VALUES AT RIGHT SIDE OF SLICE ---------------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	185.17	324	886.02	0.356	6.9	92.6
2	187.50	1143	883.00	0.208	-92.0	337.6
3	192.07	3504	879.13	0.237	-162.2	724.3
4	196.50	6295	875.82	0.260	-182.8	1018.8
5	201.53	9766	872.36	0.277	-186.8	1301.9
6	203.50	11154	871.08	0.282	-186.8	1402.7
7	205.00	12211	870.14	0.285	-186.1	1475.6
8	210.39	15915	866.93	0.295	-177.9	1710.7
9	215.98	19439	863.88	0.302	-165.4	1916.1
10	221.75	22563	861.01	0.308	-148.5	2088.8
11	227.68	25089	858.32	0.313	-126.9	2224.8
12	233.76	26849	855.83	0.318	-99.2	2319.7
13	235.04	27106	855.34	0.320	-92.6	2333.7
14	241.28	27771	853.12	0.325	-55.3	2371.6

15	246.72	27552	851.39	0.331	-14.3	2360.7
16	253.15	26447	849.58	0.339	39.5	2306.8
17	259.66	24528	847.98	0.347	96.8	2215.7
18	266.23	21845	846.61	0.358	164.6	2076.3
19	272.85	18514	845.49	0.373	253.0	1875.4
20	279.49	14719	844.66	0.398	380.4	1592.4
21	282.00	13222	844.43	0.412	446.6	1456.8
22	288.65	9232	844.09	0.474	714.8	977.4
23	290.00	8442	844.08	0.495	800.0	845.7
24	290.76	8007	844.09	0.509	854.8	764.6
25	297.37	4833	844.14	0.687	1593.5	-92.0
26	302.50	3067	844.18	Above	3776.3	-2028.5
27	307.50	1799	844.11	Above	3027.8	-1611.6
28	313.98	454	844.09	Above	2175.0	-1226.4
29	317.28	-0	844.00	1.000	0.0	0.0

Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	EMBANKMENT FILL	129	Cohesion: 200.0 Friction angle: 23	Piezometric Line no. 1
2	RESIDUAL SOIL	126	Cohesion: 100.0 Friction angle: 25	Piezometric Line no. 1
3	SHALE	130	Cohesion: 100.0 Friction angle: 25	Piezometric Line no. 2

Date: Tue Sep Filename: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .UT4Time: 15:47:03

TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.0.1.5 - Last Revision Date: 2/15/2003


```
******************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE          *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE        *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA       *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE  *
* READ ALL DOCUMENTATION FOR THIS SOFTWARE BEFORE ATTEMPTING     *
* TO USE IT.  NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT     *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR      *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS      *
* OR ADAPTABILITY OF THIS SOFTWARE.                              *
******************************************************************
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 3

```
*************************
* NEW PROFILE LINE DATA *
*************************
```

----- Profile Line No. 1 - Material Type (Number): 1 -----

Description: EMBANKMENT FILL

Point	X	Y
1	40.00	863.00
2	97.50	886.00
3	107.50	890.00
4	123.50	890.00
5	191.00	863.00

----- Profile Line No. 2 - Material Type (Number): 2 -----

Description: RESIDUAL SOIL

Point	X	Y
1	0.00	863.00
2	40.00	863.00
3	169.00	863.00
4	191.00	863.00
5	300.00	863.00

----- Profile Line No. 3 - Material Type (Number): 3 -----

Description: SHALE

Point	X	Y
1	0.00	858.00
2	300.00	858.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 4
****
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
****

------------------ DATA FOR MATERIAL NUMBER 1 ------------------

Description: EMBANKMENT FILL

Unit weight of soil (material): 129.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 200.0
Friction angle - - - - - 23.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------ DATA FOR MATERIAL NUMBER 2 ------------------

Description: RESIDUAL SOIL

Unit weight of soil (material): 126.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 100.0
Friction angle - - - - - 25.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------ DATA FOR MATERIAL NUMBER 3 ------------------

Description: SHALE

Unit weight of soil (material): 130.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 100.0
Friction angle - - - - - 25.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 2
Negative pore water pressures are NOT allowed - set to zero.

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 6
*********************************************************************
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************

---------------------------------------------------------
--------------- Piezometric Line Number 1 ---------------
---------------------------------------------------------
Description: PIEZOMETRIC LINE FOR EMBANKMENT
Unit weight of fluid (water): 62.4

Point         X            Y

  1         0.00       886.00
  2        97.50       886.00
  3       106.00       879.00
  4       114.00       878.50
  5       128.00       877.00
  6       140.00       874.00
  7       150.00       871.00
  8       169.00       863.00
  9       300.00       863.00

---------------------------------------------------------
--------------- Piezometric Line Number 2 ---------------
---------------------------------------------------------
Description: BEDROCK
Unit weight of fluid (water): 62.4

Point         X            Y

  1         0.00       860.00
  2       300.00       860.00
```


```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS
```


```
TABLE NO. 11
*********************************************************************
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************
                                      Normal         Shear
Point        X            Y          Pressure       Stress

Distributed loads will be generated from piezometric line number 1
See Output Table number 27
```

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 16
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************

Starting Center Coordinate for Search at -
                                            X: 175.00
                                            Y: 930.00

Required accuracy for critical center
(= minimum spacing between grid points): 1.000

No center allowed to pass below: 900.00

Critical shear surface not allowed to pass below Y: 858.00
For the initial mode of search circles are tangent to horizontal line at -
                                            Y: 858.00
                                            Radius: 72.00


Depth of crack: 1.000

Depth of water (or other fluid) in crack: 1.000
Automatic search output will be in short form.
Procedure of Analysis: Spencer

--------------------------------------------------------------------------------
The following represent default values or values that were prevously defined:
Subtended angle for slice subdivision: 3.00(degrees)
Conventional (single-stage) computations will be performed.
Seismic coefficient: 0.000
Unit weight of water (or other fluid) in crack: 62.4
Search will be continued after the initial mode to find a most critical circle.
Maximum number of trial grids for a given search mode: 50
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Standard sign convention used for direction of shear stress on shear surface.
Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
Minimum weight required for computations to be performed: 100
Initial trial factor of safety: 3.000
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure:
-10.00
```


```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-506 .dat
```

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 26
****
* NEW, COMPUTED SLOPE GEOMETRY DATA *
****

These slope geometry were generated from the Profile Lines.

Point	X	Y
1	0.00	863.00
2	40.00	863.00
3	97.50	886.00
4	107.50	890.00
5	123.50	890.00
6	169.00	871.80
7	191.00	863.00
8	300.00	863.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 27
****
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
****

Point	X	Y	Normal Pressure	Shear Stress
1	0.00	863.00	1435.2	0.0
2	40.00	863.00	1435.2	0.0
3	97.50	886.00	0.0	0.0

The above data were generated automatically from piezometric
line number 1.

Search will be conducted for RIGHT face of slope

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 32
****
* SHORT-FORM OUTPUT FOR TYPE 1 AUTOMATIC SEARCH WITH CIRCLES *
****

Center Coordinates of Critical Circle	1-Stage Factor of	Side Force

Mode of Search Messages	X	Y	Radius	Safety	Inclin.
Circles tangent to horiz. line at Y = 858.00	173.00	927.00	69.000	1.499	-15.64
Circles all have the same radius = 69.000	173.00	927.00	69.000	1.499	-15.64

```
***************************************************************
CAUTION - THE FACTOR OF SAFETY COULD NOT BE COMPUTED
FOR SOME OF THE GRID POINTS AROUND THE MINIMUM
***************************************************************
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 33

```
***********************************************
* 1-STAGE FINAL CRITICAL CIRCLE INFORMATION *
***********************************************
```

CAUTION - THE FACTOR OF SAFETY COULD NOT BE COMPUTED
FOR SOME OF THE GRID POINTS AROUND THE MINIMUM

```
X Coordinate of Center . . . . . . . . . . . . . .  173.00
Y Coordinate of Center . . . . . . . . . . . . . .  927.00
Radius . . . . . . . . . . . . . . . . . . . . . .  69.00
Factor of Safety . . . . . . . . . . . . . . . . . 1.499
Side Force Inclination (degrees) . . . . . . . . . -15.64
Number of Circles Tried  . . . . . . . . . . . . .  83
Number of Circles F Calculated for . . . . . . . .  67
Time Required for Search (seconds) . . . . . . . .  0.1
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 43

```
***************************************************************
* Coordinate, Weight, Strength and Pore Water Pressure        *
* Information for Individual Slices for Conventional          *
* Computations or First Stage of Multi-Stage Computations.    *
* (Information is for the critical shear surface in the       *
* case of an automatic search.)                               *
***************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. No.	Cohesion	Friction Angle	Pore Pressure
	115.41	889.00					

1	116.44	887.52	662	1	200.0	23.00	0.0
	117.47	886.04					
2	118.58	884.61	1543	1	200.0	23.00	0.0
	119.69	883.19					
3	120.88	881.82	2496	1	200.0	23.00	0.0
	122.06	880.46					
4	122.78	879.69	1914	1	200.0	23.00	0.0
	123.50	878.93					
5	124.31	878.12	2428	1	200.0	23.00	0.0
	125.13	877.31					
6	126.46	876.09	4377	1	200.0	23.00	67.1
	127.79	874.87					
7	127.90	874.78	356	1	200.0	23.00	139.1
	128.00	874.69					
8	129.40	873.55	5087	1	200.0	23.00	193.4
	130.80	872.41					
9	132.26	871.34	5698	1	200.0	23.00	286.6
	133.71	870.28					
10	135.23	869.29	6248	1	200.0	23.00	368.6
	136.74	868.30					
11	138.30	867.39	6722	1	200.0	23.00	439.1
	139.86	866.48					
12	139.93	866.44	310	1	200.0	23.00	472.7
	140.00	866.40					
13	141.61	865.58	7127	1	200.0	23.00	495.2
	143.22	864.76					
14	144.87	864.02	7417	1	200.0	23.00	531.5
	146.51	863.29					
15	146.86	863.14	1576	1	200.0	23.00	549.0
	147.21	863.00					
16	148.61	862.47	6283	2	100.0	25.00	558.2
	150.00	861.95					
17	151.72	861.39	7662	2	100.0	25.00	554.6
	153.44	860.83					
18	154.97	860.42	6710	2	100.0	25.00	529.8
	156.51	860.00					
19	158.27	859.61	7465	2	100.0	25.00	493.1
	160.04	859.23					
20	161.82	858.94	7193	2	100.0	25.00	442.3
	163.60	858.64					
21	165.40	858.44	6805	2	100.0	25.00	379.0
	167.19	858.24					
22	168.10	858.18	3235	2	100.0	25.00	324.5
	169.00	858.12					
23	170.81	858.06	6010	2	100.0	25.00	308.3
	172.61	858.00					
24	172.81	858.00	611	2	100.0	25.00	312.0
	173.00	858.00					
25	174.81	858.05	5271	2	100.0	25.00	309.0
	176.61	858.09					
26	178.41	858.24	4501	2	100.0	25.00	297.3
	180.21	858.38					
27	182.00	858.61	3642	2	100.0	25.00	273.7
	183.79	858.85					
28	185.57	859.18	2705	2	100.0	25.00	238.5
	187.35	859.51					
29	188.42	859.75	1164	2	100.0	25.00	202.6
	189.49	860.00					
30	190.25	860.19	592	2	100.0	25.00	175.1
	191.00	860.39					
31	192.73	860.91	913	2	100.0	25.00	130.7
	194.46	861.42					
32	196.16	862.03	416	2	100.0	25.00	60.6

```
        197.86    862.64
  33    198.33    862.82           21    2        100.0    25.00         11.4
        198.79    863.00
```
□
UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 44
```
**********************************************************
* Seismic Forces and Forces Due to Distributed Loads for *
* Individual Slices for Conventional Computations or the *
* First Stage of Multi-Stage Computations.               *
* (Information is for the critical shear surface in the  *
* case of an automatic search.)                          *
**********************************************************
```

There are no seismic forces or forces due to distributed loads
for the current shear surface
□
UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 47
```
**************************************************************
*  Information for the Iterative Solution for the Factor of  *
*  Safety and Side Force Inclination by Spencer's Procedure  *
**************************************************************
```
Allowable force imbalance for convergence: 1
Allowable moment imbalance for convergence: 190

```
       Trial     Trial
       Factor   Side Force    Force       Moment                  Delta
Iter-    of     Inclination  Imbalance    Imbalance    Delta-F     Theta
ation  Safety   (degrees)     (lbs.)     (ft.-lbs.)              (degrees)

   1   3.00000   -17.1887  -2.004e+004   1.745e+007
First-order corrections to F and Theta ............   -2.9731     0.4028
Reduced values - Deltas were too large ............   -0.5000     0.0677

   2   2.50000   -17.1210  -1.599e+004   1.392e+007
First-order corrections to F and Theta ............   -1.6491     0.4548
Reduced values - Deltas were too large ............   -0.5000     0.1379

   3   2.00000   -16.9831  -9.920e+003   8.633e+006
First-order corrections to F and Theta ............   -0.6573     0.5654
Reduced values - Deltas were too large ............   -0.5000     0.4300

   4   1.50000   -16.5530   1.752e+002  -1.651e+005
First-order corrections to F and Theta ............   -0.0017     0.9234
Second-order corrections to F and Theta ...........   -0.0015     0.9075
```

```
   5   1.49852   -15.6455  -7.727e-002   4.677e+001
First-order corrections to F and Theta ...........   -0.0000     0.0016
Second-order corrections to F and Theta ..........   -0.0000     0.0016

   6   1.49851   -15.6440  -1.244e-010   1.188e-007
First-order corrections to F and Theta ...........    0.0000    -0.0000
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 55

```
********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)      *
********************************************************************
```

Summation of Horizontal Forces: 1.02496e-011

Summation of Vertical Forces: 8.12861e-012

Summation of Moments: -3.02680e-009

Mohr Coulomb Shear Force/Shear Strength Check Summation: 5.65592e-012

***** CAUTION ***** Forces Between Slices are NEGATIVE at Points
Along the UPPER one-half of the Shear Surface -
A Tension Crack may Be Needed

***** CAUTION ***** Some of the Forces Between Slices Act at Points
Above the Surface of the Slope or Below the Shear Surface -
Either a Tension Crack may be Needed or the SOLUTION MAY NOT
BE A VALID SOLUTION

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 58

```
************************************************************************
* Final Results for Stresses Along the Shear Surface                   *
* (Results are for the critical shear surface in the case of a search.) *
************************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.499   Side Force Inclination: -15.64

-------- VALUES AT CENTER OF BASE OF SLICE --------

Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	116.44	887.52	93.8	93.8	160.0

2	118.58	884.61	341.3	341.3	230.1
3	120.88	881.82	597.4	597.4	302.7
4	122.78	879.69	806.7	806.7	362.0
5	124.31	878.12	941.5	941.5	400.2
6	126.46	876.09	1093.0	1025.9	424.1
7	127.90	874.78	1194.8	1055.7	432.5
8	129.40	873.55	1286.3	1092.9	443.0
9	132.26	871.34	1448.8	1162.2	462.7
10	135.23	869.29	1594.7	1226.1	480.8
11	138.30	867.39	1722.4	1283.3	497.0
12	139.93	866.44	1784.1	1311.4	504.9
13	141.61	865.58	1834.6	1339.3	512.9
14	144.87	864.02	1920.6	1389.0	526.9
15	146.86	863.14	1964.7	1415.7	534.5
16	148.61	862.47	1992.7	1434.5	513.1
17	151.72	861.39	2023.0	1468.4	523.7
18	154.97	860.42	2035.3	1505.5	535.2
19	158.27	859.61	2024.8	1531.7	543.4
20	161.82	858.94	1989.8	1547.5	548.3
21	165.40	858.44	1928.1	1549.2	548.8
22	168.10	858.18	1866.0	1541.5	546.4
23	170.81	858.06	1779.0	1470.6	524.4
24	172.81	858.00	1706.2	1394.2	500.6
25	174.81	858.05	1616.6	1307.5	473.6
26	178.41	858.24	1431.9	1134.7	419.8
27	182.00	858.61	1208.7	935.0	357.7
28	185.57	859.18	943.9	705.4	286.2
29	188.42	859.75	699.9	497.4	221.5
30	190.25	860.19	524.8	349.7	175.6
31	192.73	860.91	378.8	248.1	143.9
32	196.16	862.03	217.7	157.1	115.6
33	198.33	862.82	96.5	85.1	93.2

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-506 .dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-506
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 59
```
**************************************************************************
* Final Results for Side Forces and Stresses Between Slices              *
* (Results are for the critical shear surface in the case of a search.) *
**************************************************************************
```

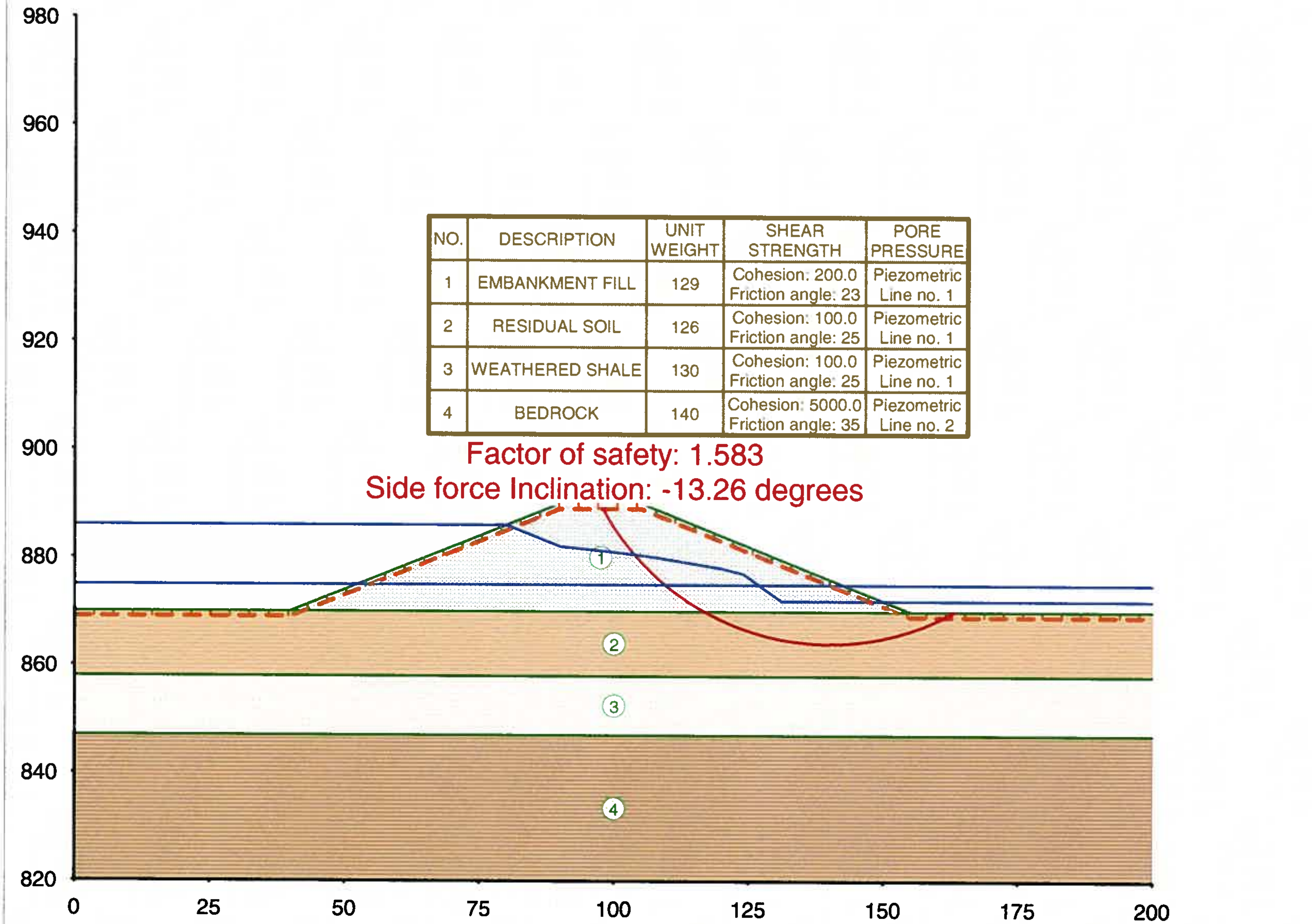
--------------- VALUES AT RIGHT SIDE OF SLICE ---------------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	117.47	-23	884.65	Below	22.7	-33.8
2	119.69	457	884.32	0.166	-65.0	194.1
3	122.06	1406	882.19	0.182	-129.0	412.8
4	123.50	2146	881.00	0.187	-164.0	537.3
5	125.13	3055	879.75	0.203	-190.9	679.5
6	127.79	4647	877.88	0.224	-218.2	885.6
7	128.00	4775	877.74	0.226	-220.2	901.0
8	130.80	6537	875.93	0.240	-240.0	1098.2
9	133.71	8347	874.21	0.252	-252.3	1280.2

10	136.74	10114	872.58	0.261	-258.3	1445.5
11	139.86	11753	871.04	0.269	-259.0	1592.3
12	140.00	11822	870.97	0.269	-258.9	1598.5
13	143.22	13241	869.54	0.276	-254.1	1723.6
14	146.51	14375	868.22	0.282	-244.1	1825.4
15	147.21	14571	867.96	0.283	-241.4	1843.6
16	150.00	15266	866.95	0.286	-236.9	1921.4
17	153.44	15739	865.83	0.291	-225.1	1988.0
18	156.51	15789	864.96	0.295	-208.2	2018.6
19	160.04	15420	864.08	0.300	-181.3	2019.4
20	163.60	14600	863.35	0.307	-144.9	1980.8
21	167.19	13351	862.75	0.316	-95.6	1896.5
22	169.00	12575	862.51	0.321	-64.2	1834.0
23	172.61	10821	862.14	0.335	8.7	1678.2
24	173.00	10621	862.11	0.337	17.3	1659.3
25	176.61	8686	861.89	0.356	106.5	1462.6
26	180.21	6694	861.82	0.385	223.1	1219.5
27	183.79	4772	861.90	0.434	395.5	911.3
28	187.35	3071	862.14	0.532	711.1	482.9
29	189.49	2220	862.34	0.650	1127.6	58.8
30	191.00	1733	862.46	0.795	1770.0	-491.9
31	194.46	809	862.72	0.824	1453.8	-466.5
32	197.86	126	862.95	0.855	1041.3	-375.7
33	198.79	0	863.00	0.000	0.0	0.0

Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.

KCPL LA CYGNE UPPER AQC POND, SECTION P-507



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	EMBANKMENT FILL	129	Cohesion: 200.0 Friction angle: 23	Piezometric Line no. 1
2	RESIDUAL SOIL	126	Cohesion: 100.0 Friction angle: 25	Piezometric Line no. 1
3	WEATHERED SHALE	130	Cohesion: 100.0 Friction angle: 25	Piezometric Line no. 1
4	BEDROCK	140	Cohesion: 5000.0 Friction angle: 35	Piezometric Line no. 2

Date: Tue Sep (Filename: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-507.UT4Time: 15:27:52

```
TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.0.1.5 - Last Revision Date: 2/15/2003
(C) Copyright 1985-2002 S. G. Wright - All rights reserved
*******************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE           *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE         *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA        *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE  *
* READ ALL DOCUMENTATION FOR THIS SOFTWARE BEFORE ATTEMPTING      *
* TO USE IT.  NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT      *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR       *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS       *
* OR ADAPTABILITY OF THIS SOFTWARE.                               *
*******************************************************************

UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 3
*************************
* NEW PROFILE LINE DATA *
*************************

-----------------------------------------------------------
----- Profile Line No. 1 - Material Type (Number): 1 -----
-----------------------------------------------------------
Description: EMBANKMENT FILL

Point         X            Y

   1        40.00       870.00
   2        80.00       886.00
   3        90.00       890.00
   4       105.00       890.00
   5       155.00       870.00

-----------------------------------------------------------
----- Profile Line No. 2 - Material Type (Number): 2 -----
-----------------------------------------------------------
Description: RESIDUAL SOIL

Point         X            Y

   1         0.00       870.00
   2       200.00       870.00

-----------------------------------------------------------
----- Profile Line No. 3 - Material Type (Number): 3 -----
-----------------------------------------------------------
Description: WEATHERED SHALE

Point         X            Y

   1         0.00       858.00
```

```
   2      200.00      858.00

-----------------------------------------------------------
----- Profile Line No. 4 - Material Type (Number): 4 -----
-----------------------------------------------------------
Description: BEDROCK

Point        X            Y

   1        0.00      847.00
   2      200.00      847.00
```

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 4
*********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
-------------------------------------------------------------------
Description: EMBANKMENT FILL

Unit weight of soil (material): 129.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 200.0
Friction angle - - - - - 23.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
-------------------------------------------------------------------
Description: RESIDUAL SOIL

Unit weight of soil (material): 126.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 100.0
Friction angle - - - - - 25.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
-------------------------------------------------------------------
Description: WEATHERED SHALE

Unit weight of soil (material): 130.0
```

```
CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 100.0
Friction angle - - - - - 25.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

-----------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 4 -------------------
-----------------------------------------------------------------
Description: BEDROCK

Unit weight of soil (material): 140.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 5000.0
Friction angle - - - - - 35.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 2
Negative pore water pressures are NOT allowed - set to zero.

UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 6
*********************************************************************
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************

---------------------------------------------------------
--------------- Piezometric Line Number 1 ---------------
---------------------------------------------------------
Description: PIEZOMETRIC LINE FOR EMBANKMENT
Unit weight of fluid (water): 62.4

Point         X            Y

  1          0.00       886.00
  2         80.00       886.00
  3         90.00       882.00
  4        100.00       881.00
  5        108.00       880.00
  6        120.00       878.00
  7        124.00       877.00
  8        131.00       872.00
  9        200.00       872.00

---------------------------------------------------------
--------------- Piezometric Line Number 2 ---------------
---------------------------------------------------------
Description: BEDROCK
Unit weight of fluid (water): 62.4

Point         X            Y
```

```
  1       0.00       875.00
  2     200.00       875.00
```

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 11
**********************************************************************
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************
                                          Normal        Shear
Point       X           Y               Pressure       Stress

Distributed loads will be generated from piezometric line number 1
See Output Table number 27
```



```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS
```


```
TABLE NO. 16
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************

Starting Center Coordinate for Search at -
                                             X: 125.00
                                             Y: 945.00

Required accuracy for critical center
(= minimum spacing between grid points): 1.000

No center allowed to pass below: 900.00

Critical shear surface not allowed to pass below Y: 847.00
For the initial mode of search circles are tangent to horizontal line at -
                                             Y: 850.00
                                             Radius: 95.00


Depth of crack: 1.000

Depth of water (or other fluid) in crack: 1.000
Automatic search output will be in short form.
Procedure of Analysis: Spencer

--------------------------------------------------------------------------------
The following represent default values or values that were prevously defined:
Subtended angle for slice subdivision: 3.00(degrees)
Conventional (single-stage) computations will be performed.
Seismic coefficient: 0.000
```

Unit weight of water (or other fluid) in crack: 62.4
Search will be continued after the initial mode to find a most critical circle.
Maximum number of trial grids for a given search mode: 50
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Standard sign convention used for direction of shear stress on shear surface.
Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
Minimum weight required for computations to be performed: 100
Initial trial factor of safety: 3.000
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure:
-10.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 26
****
* NEW, COMPUTED SLOPE GEOMETRY DATA *
****

These slope geometry were generated from the Profile Lines.

Point	X	Y
1	0.00	870.00
2	40.00	870.00
3	80.00	886.00
4	90.00	890.00
5	105.00	890.00
6	155.00	870.00
7	200.00	870.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 27
****
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
****

Point	X	Y	Normal Pressure	Shear Stress
1	0.00	870.00	998.4	0.0
2	40.00	870.00	998.4	0.0
3	80.00	886.00	0.0	0.0
4	150.00	872.00	0.0	0.0
5	155.00	870.00	124.8	0.0

```
  6      200.00      870.00       124.8           0.0

The above data were generated automatically from piezometric
line number 1.

UTEXAS WARNING NUMBER 4240
Possible artesian pressures detected at x = 150.00
from piezometric line number 2 (Stage 1).

UTEXAS WARNING NUMBER 4240
Possible artesian pressures detected at x = 155.00
from piezometric line number 2 (Stage 1).

UTEXAS WARNING NUMBER 4240
Possible artesian pressures detected at x = 200.00
from piezometric line number 2 (Stage 1).

Search will be conducted for RIGHT face of slope

UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 32
**************************************************************
* SHORT-FORM OUTPUT FOR TYPE 1 AUTOMATIC SEARCH WITH CIRCLES *
**************************************************************
```

Mode of Search Messages	Center Coordinates of Critical Circle X	Y	Radius	1-Stage Factor of Safety	Side Force Inclin.
Circles tangent to horiz. line at Y = 850.00	140.00	906.00	56.000	1.965	-7.66
Circles all have the same radius = 56.000	141.00	920.00	56.000	1.598	-12.63
Circles tangent to horiz. line at Y = 864.00	140.00	912.00	48.000	1.583	-13.26
Circles all have the same radius = 48.000	140.00	912.00	48.000	1.583	-13.26

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
```

DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 33
```
*********************************************
* 1-STAGE FINAL CRITICAL CIRCLE INFORMATION *
*********************************************
X Coordinate of Center . . . . . . . . . . . . .  140.00
Y Coordinate of Center . . . . . . . . . . . . .  912.00
Radius . . . . . . . . . . . . . . . . . . . . .  48.00
Factor of Safety . . . . . . . . . . . . . . . . 1.583
Side Force Inclination (degrees) . . . . . . . . -13.26
Number of Circles Tried  . . . . . . . . . . . .  171
Number of Circles F Calculated for . . . . . . .  137
Time Required for Search (seconds) . . . . . . .  0.2
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 43
```
************************************************************
* Coordinate, Weight, Strength and Pore Water Pressure     *
* Information for Individual Slices for Conventional       *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the critical shear surface in the    *
* case of an automatic search.)                            *
************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. No.	Cohesion	Friction Angle	Pore Pressure
	97.87	889.00					
1	98.50	887.91	340	1	200.0	23.00	0.0
	99.13	886.83					
2	99.57	886.15	432	1	200.0	23.00	0.0
	100.00	885.47					
3	100.72	884.44	1036	1	200.0	23.00	0.0
	101.44	883.41					
4	102.22	882.42	1515	1	200.0	23.00	0.0
	102.99	881.43					
5	103.37	880.98	887	1	200.0	23.00	0.0
	103.76	880.53					
6	104.38	879.84	1631	1	200.0	23.00	38.2
	105.00	879.15					
7	105.88	878.26	2596	1	200.0	23.00	125.2
	106.77	877.37					
8	107.38	876.79	1949	1	200.0	23.00	204.9
	108.00	876.22					
9	108.71	875.61	2367	1	200.0	23.00	266.4
	109.42	875.00					
10	110.41	874.23	3473	1	200.0	23.00	335.3
	111.40	873.45					
11	112.43	872.73	3794	1	200.0	23.00	407.7
	113.46	872.01					
12	114.52	871.34	4080	1	200.0	23.00	472.6
	115.59	870.67					
13	116.17	870.34	2304	1	200.0	23.00	518.0
	116.76	870.00					
14	117.88	869.42	4434	2	100.0	25.00	557.4

	118.99	868.84					
15	119.50	868.60	2024	2	100.0	25.00	591.6
	120.00	868.37					
16	121.16	867.87	4656	2	100.0	25.00	614.0
	122.31	867.38					
17	123.16	867.06	3400	2	100.0	25.00	633.3
	124.00	866.75					
18	125.20	866.36	4773	2	100.0	25.00	610.8
	126.39	865.97					
19	127.60	865.65	4764	2	100.0	25.00	547.9
	128.82	865.32					
20	129.91	865.09	4176	2	100.0	25.00	480.1
	131.00	864.85					
21	132.24	864.65	4585	2	100.0	25.00	458.8
	133.48	864.44					
22	134.73	864.31	4404	2	100.0	25.00	480.1
	135.98	864.17					
23	137.23	864.10	4166	2	100.0	25.00	493.2
	138.49	864.02					
24	139.24	864.01	2373	2	100.0	25.00	498.5
	140.00	864.00					
25	141.26	864.03	3670	2	100.0	25.00	497.1
	142.51	864.07					
26	143.76	864.16	3294	2	100.0	25.00	488.9
	145.02	864.26					
27	146.26	864.43	2873	2	100.0	25.00	472.6
	147.51	864.59					
28	148.74	864.82	2410	2	100.0	25.00	448.0
	149.98	865.05					
29	149.99	865.05	18	2	100.0	25.00	433.6
	150.00	865.05					
30	151.22	865.35	1909	2	100.0	25.00	415.1
	152.44	865.64					
31	153.65	866.00	1383	2	100.0	25.00	374.5
	154.85	866.36					
32	154.93	866.38	68	2	100.0	25.00	350.7
	155.00	866.40					
33	156.18	866.83	946	2	100.0	25.00	322.8
	157.37	867.25					
34	158.52	867.74	661	2	100.0	25.00	266.0
	159.68	868.22					
35	160.82	868.77	352	2	100.0	25.00	201.8
	161.95	869.31					
36	162.59	869.66	56	2	100.0	25.00	146.3
	163.24	870.00					

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 44
***********************************************************
* Seismic Forces and Forces Due to Distributed Loads for *
* Individual Slices for Conventional Computations or the *
* First Stage of Multi-Stage Computations.               *
* (Information is for the critical shear surface in the  *
* case of an automatic search.)                          *
***********************************************************
```

Slices No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO DISTRIBUTED LOADS Normal Force	Shear Force	X	Y
1	98.50	0	888.96	0	0	98.50	887.91
2	99.57	0	888.07	0	0	99.57	886.15
3	100.72	0	887.22	0	0	100.72	884.44
4	102.22	0	886.21	0	0	102.22	882.42
5	103.37	0	885.49	0	0	103.37	880.98
6	104.38	0	884.92	0	0	104.38	879.84
7	105.88	0	883.95	0	0	105.88	878.26
8	107.38	0	882.92	0	0	107.38	876.79
9	108.71	0	882.06	0	0	108.71	875.61
10	110.41	0	881.03	0	0	110.41	874.23
11	112.43	0	879.88	0	0	112.43	872.73
12	114.52	0	878.77	0	0	114.52	871.34
13	116.17	0	877.93	0	0	116.17	870.34
14	117.88	0	877.14	0	0	117.88	869.42
15	119.50	0	876.42	0	0	119.50	868.60
16	121.16	0	875.73	0	0	121.16	867.87
17	123.16	0	874.93	0	0	123.16	867.06
18	125.20	0	874.17	0	0	125.20	866.36
19	127.60	0	873.34	0	0	127.60	865.65
20	129.91	0	872.60	0	0	129.91	865.09
21	132.24	0	871.92	0	0	132.24	864.65
22	134.73	0	871.25	0	0	134.73	864.31
23	137.23	0	870.64	0	0	137.23	864.10
24	139.24	0	870.19	0	0	139.24	864.01
25	141.26	0	869.80	0	0	141.26	864.03
26	143.76	0	869.36	0	0	143.76	864.16
27	146.26	0	868.99	0	0	146.26	864.43
28	148.74	0	868.68	0	0	148.74	864.82
29	149.99	0	868.54	0	0	149.99	865.05
30	151.22	0	868.44	80	0	151.63	871.35
31	153.65	0	868.28	236	0	153.78	870.49
32	154.93	0	868.21	20	0	154.93	870.03
33	156.18	0	868.41	295	0	156.18	870.00
34	158.52	0	868.87	289	0	158.52	870.00
35	160.82	0	869.38	283	0	160.82	870.00
36	162.59	0	869.83	161	0	162.59	870.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 47
```
*****************************************************************
*  Information for the Iterative Solution for the Factor of   *
*  Safety and Side Force Inclination by Spencer's Procedure   *
*****************************************************************
```
Allowable force imbalance for convergence: 8.7799e-001
Allowable moment imbalance for convergence: 111

Iter-	Trial Factor of	Trial Side Force Inclination	Force Imbalance	Moment Imbalance	Delta-F	Delta Theta

```
ation  Safety   (degrees)      (lbs.)    (ft.-lbs.)             (degrees)

   1   3.00000   -17.1887  -1.181e+004  1.022e+007
First-order corrections to F and Theta ............    -2.5485    0.9508
Reduced values - Deltas were too large ............    -0.5000    0.1865

   2   2.50000   -17.0022  -9.021e+003  7.805e+006
First-order corrections to F and Theta ............    -1.3602    1.1214
Reduced values - Deltas were too large ............    -0.5000    0.4122

   3   2.00000   -16.5900  -4.852e+003  4.191e+006
First-order corrections to F and Theta ............    -0.4851    1.5108
Second-order corrections to F and Theta ...........    -0.4323    3.3532
Reduced values - Deltas were too large ............    -0.3694    2.8648

   4   1.63064   -13.7252  -6.740e+002  5.857e+005
First-order corrections to F and Theta ............    -0.0485    0.4142
Second-order corrections to F and Theta ...........    -0.0479    0.4617

   5   1.58278   -13.2635   5.861e-001  -5.079e+002
First-order corrections to F and Theta ............     0.0000   -0.0006
Second-order corrections to F and Theta ...........     0.0000   -0.0006

   6   1.58282   -13.2641  -4.591e-010   3.835e-007
First-order corrections to F and Theta ............    -0.0000    0.0000
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 55

```
*********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)       *
*********************************************************************
```

Summation of Horizontal Forces: 9.78329e-012

Summation of Vertical Forces: 6.93490e-012

Summation of Moments: 8.14907e-010

Mohr Coulomb Shear Force/Shear Strength Check Summation: 4.24105e-012

***** CAUTION ***** Forces Between Slices are NEGATIVE at Points
Along the UPPER one-half of the Shear Surface -
A Tension Crack may Be Needed

***** CAUTION ***** Some of the Forces Between Slices Act at Points
Above the Surface of the Slope or Below the Shear Surface -
Either a Tension Crack may be Needed or the SOLUTION MAY NOT
BE A VALID SOLUTION

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 58
****
* Final Results for Stresses Along the Shear Surface *
* (Results are for the critical shear surface in the case of a search.) *
****

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.583 Side Force Inclination: -13.26

-------- VALUES AT CENTER OF BASE OF SLICE --------

Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	98.50	887.91	41.8	41.8	137.6
2	99.57	886.15	190.9	190.9	177.5
3	100.72	884.44	342.7	342.7	218.3
4	102.22	882.42	535.4	535.4	269.9
5	103.37	880.98	681.6	681.6	309.1
6	104.38	879.84	808.9	770.7	333.0
7	105.88	878.26	966.0	840.8	351.8
8	107.38	876.79	1090.9	886.1	364.0
9	108.71	875.61	1190.0	923.5	374.0
10	110.41	874.23	1303.6	968.4	386.0
11	112.43	872.73	1423.2	1015.5	398.7
12	114.52	871.34	1529.7	1057.1	409.9
13	116.17	870.34	1603.6	1085.5	417.5
14	117.88	869.42	1672.5	1115.1	391.7
15	119.50	868.60	1722.3	1130.7	396.3
16	121.16	867.87	1760.6	1146.6	401.0
17	123.16	867.06	1798.0	1164.7	406.3
18	125.20	866.36	1820.5	1209.7	419.6
19	127.60	865.65	1832.8	1284.9	441.7
20	129.91	865.09	1830.6	1350.5	461.0
21	132.24	864.65	1811.9	1353.2	461.8
22	134.73	864.31	1772.7	1292.7	444.0
23	137.23	864.10	1712.5	1219.3	422.4
24	139.24	864.01	1649.9	1151.5	402.4
25	141.26	864.03	1570.1	1072.9	379.3
26	143.76	864.16	1450.9	962.0	346.6
27	146.26	864.43	1307.1	834.6	309.0
28	148.74	864.82	1137.3	689.2	266.2
29	149.99	865.05	1043.3	609.7	242.8
30	151.22	865.35	979.4	564.2	229.4
31	153.65	866.00	838.7	464.2	199.9
32	154.93	866.38	755.5	404.8	182.4
33	156.18	866.83	682.7	359.9	169.2
34	158.52	867.74	564.6	298.5	151.1
35	160.82	868.77	418.9	217.2	127.2
36	162.59	869.66	283.5	137.3	103.6

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-507.dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-507
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

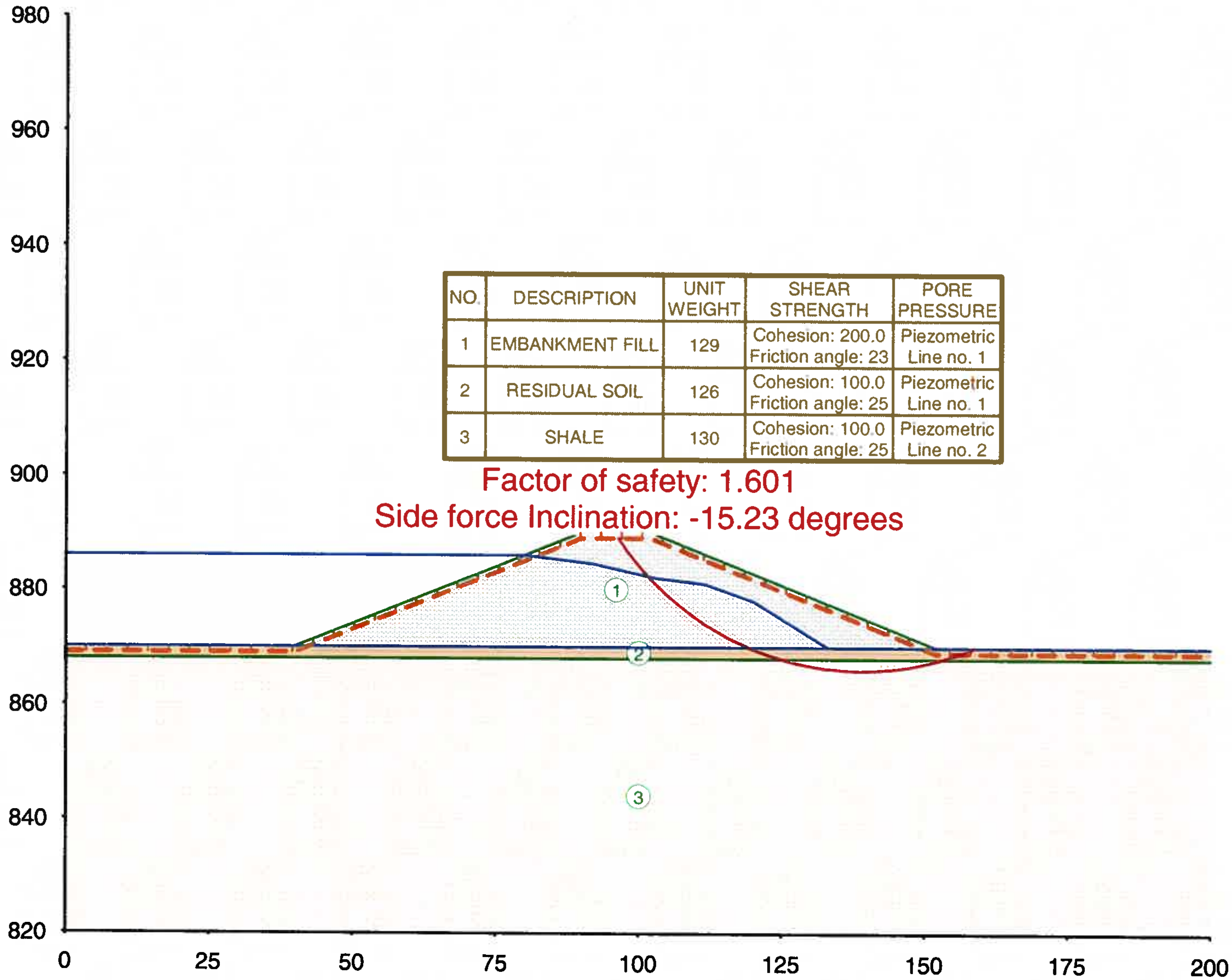
TABLE NO. 59
```
****************************************************************************
* Final Results for Side Forces and Stresses Between Slices                *
* (Results are for the critical shear surface in the case of a search.) *
****************************************************************************
```

--------------- VALUES AT RIGHT SIDE OF SLICE ---------------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	99.13	-53	886.90	0.024	30.1	-62.5
2	100.00	55	885.42	Below	-24.5	48.2
3	101.44	456	884.37	0.145	-76.0	210.7
4	102.99	1115	882.96	0.178	-117.8	371.0
5	103.76	1503	882.29	0.186	-136.6	445.6
6	105.00	2223	881.25	0.194	-167.2	566.1
7	106.77	3357	879.89	0.212	-199.4	747.3
8	108.00	4177	879.02	0.223	-214.5	861.0
9	109.42	5125	878.09	0.233	-226.1	980.1
10	111.40	6416	876.89	0.246	-234.0	1126.8
11	113.46	7685	875.76	0.257	-234.9	1258.8
12	115.59	8885	874.69	0.266	-229.9	1375.8
13	116.76	9488	874.15	0.271	-224.9	1432.5
14	118.99	10582	873.16	0.278	-221.2	1545.0
15	120.00	11014	872.75	0.280	-217.6	1589.0
16	122.31	11847	871.88	0.287	-204.8	1674.1
17	124.00	12312	871.31	0.292	-192.1	1723.0
18	126.39	12732	870.59	0.299	-166.6	1768.3
19	128.82	12852	869.98	0.307	-129.5	1780.7
20	131.00	12702	869.52	0.316	-85.8	1762.3
21	133.48	12281	869.09	0.328	-27.9	1715.9
22	135.98	11645	868.74	0.340	35.9	1650.7
23	138.49	10811	868.49	0.355	108.0	1564.7
24	140.00	10226	868.38	0.365	156.7	1502.2
25	142.51	9141	868.27	0.384	249.1	1379.0
26	145.02	7955	868.24	0.409	361.6	1229.9
27	147.51	6723	868.30	0.441	504.8	1052.3
28	149.98	5512	868.42	0.484	698.5	843.4
29	150.00	5503	868.42	0.485	700.4	841.6
30	152.44	4305	868.58	0.547	997.7	559.4
31	154.85	3104	868.79	0.656	1581.0	50.5
32	155.00	3031	868.80	0.666	1638.8	2.1
33	157.37	2025	869.08	0.666	1433.1	1.5
34	159.68	1103	869.43	0.682	1262.2	-55.0
35	161.95	338	869.81	0.721	1110.9	-155.5
36	163.24	-0	870.00	0.000	0.0	0.0

Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.

KCPL LA CYGNE UPPER AQC POND, SECTION P-508



Date: Tue Sep Filename: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .UT4Time: 15:51:18

```
TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.0.1.5 - Last Revision Date: 2/15/2003
(C) Copyright 1985-2002 S. G. Wright - All rights reserved
*******************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE           *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE         *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA        *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS  *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE   *
* READ ALL DOCUMENTATION FOR THIS SOFTWARE BEFORE ATTEMPTING      *
* TO USE IT.  NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT      *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR       *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS       *
* OR ADAPTABILITY OF THIS SOFTWARE.                               *
*******************************************************************

UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 3
*************************
* NEW PROFILE LINE DATA *
*************************

-----------------------------------------------------------
----- Profile Line No. 1 - Material Type (Number): 1 -----
-----------------------------------------------------------
Description: EMBANKMENT FILL

Point         X            Y

   1        40.00       870.00
   2        80.00       886.00
   3        90.00       890.00
   4       102.00       890.00
   5       152.00       870.00

-----------------------------------------------------------
----- Profile Line No. 2 - Material Type (Number): 2 -----
-----------------------------------------------------------
Description: RESIDUAL SOIL

Point         X            Y

   1         0.00       870.00
   2        40.00       870.00
   3       152.00       870.00
   4       200.00       870.00

-----------------------------------------------------------
----- Profile Line No. 3 - Material Type (Number): 3 -----
-----------------------------------------------------------
Description: SHALE

Point         X            Y
```

```
   1        0.00       868.00
   2      200.00       868.00

UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 4
**********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
------------------------------------------------------------------
Description: EMBANKMENT FILL

Unit weight of soil (material): 129.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 200.0
Friction angle - - - - - 23.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
------------------------------------------------------------------
Description: RESIDUAL SOIL

Unit weight of soil (material): 126.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 100.0
Friction angle - - - - - 25.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
------------------------------------------------------------------
Description: SHALE

Unit weight of soil (material): 130.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 100.0
Friction angle - - - - - 25.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 2
Negative pore water pressures are NOT allowed - set to zero.
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 6
****
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
****

--------------- Piezometric Line Number 1 ---------------

Description: PIEZOMETRIC LINE FOR EMBANKMENT
Unit weight of fluid (water): 62.4

Point	X	Y
1	0.00	886.00
2	80.00	886.00
3	92.00	884.50
4	103.00	882.00
5	111.50	881.00
6	120.00	878.00
7	133.00	870.00
8	200.00	870.00

--------------- Piezometric Line Number 2 ---------------

Description: SHALE
Unit weight of fluid (water): 62.4

Point	X	Y
1	0.00	870.00
2	200.00	870.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 11
****
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
****

Point	X	Y	Normal Pressure	Shear Stress

Distributed loads will be generated from piezometric line number 1
See Output Table number 27

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003

Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 16
****
* NEW ANALYSIS/COMPUTATION DATA *
****

Starting Center Coordinate for Search at -
X: 150.00
Y: 920.00

Required accuracy for critical center
(= minimum spacing between grid points): 1.000

No center allowed to pass below: 900.00

Critical shear surface not allowed to pass below Y: 860.00
For the initial mode of search circles are tangent to horizontal line at -
Y: 868.00
Radius: 52.00

Depth of crack: 1.000

Depth of water (or other fluid) in crack: 1.000
Automatic search output will be in short form.
Procedure of Analysis: Spencer

The following represent default values or values that were prevously defined:
Subtended angle for slice subdivision: 3.00(degrees)
Conventional (single-stage) computations will be performed.
Seismic coefficient: 0.000
Unit weight of water (or other fluid) in crack: 62.4
Search will be continued after the initial mode to find a most critical circle.
Maximum number of trial grids for a given search mode: 50
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Standard sign convention used for direction of shear stress on shear surface.
Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
Minimum weight required for computations to be performed: 100
Initial trial factor of safety: 3.000
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure: -10.00
□
UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 26
```
**************************************
* NEW, COMPUTED SLOPE GEOMETRY DATA *
**************************************
```

These slope geometry were generated from the Profile Lines.

Point	X	Y
1	0.00	870.00
2	40.00	870.00
3	80.00	886.00
4	90.00	890.00
5	102.00	890.00
6	152.00	870.00
7	200.00	870.00

□
UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 27
```
*********************************************************************
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************
```

Point	X	Y	Normal Pressure	Shear Stress
1	0.00	870.00	998.4	0.0
2	40.00	870.00	998.4	0.0
3	80.00	886.00	0.0	0.0

The above data were generated automatically from piezometric line number 1.

Search will be conducted for RIGHT face of slope
□
UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 32
```
**************************************************************
* SHORT-FORM OUTPUT FOR TYPE 1 AUTOMATIC SEARCH WITH CIRCLES *
**************************************************************
```

Mode of Search / Messages	Center Coordinates of Critical Circle X	Y	Radius	1-Stage Factor of Safety	Side Force Inclin.

```
Circles tangent to horiz.     138.00      921.00      53.000      1.641  -15.92
line at Y = 868.00


Circles all have the same     139.00      919.00      53.000      1.602  -15.05
radius = 53.000


Circles tangent to horiz.     139.00      917.00      51.000      1.601  -15.23
line at Y = 866.00
```

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 33
*********************************************
* 1-STAGE FINAL CRITICAL CIRCLE INFORMATION *
*********************************************
X Coordinate of Center . . . . . . . . . . . . . .  139.00
Y Coordinate of Center . . . . . . . . . . . . . .  917.00
Radius . . . . . . . . . . . . . . . . . . . . . .  51.00
Factor of Safety . . . . . . . . . . . . . . . . . 1.601
Side Force Inclination (degrees) . . . . . . . . . -15.23
Number of Circles Tried  . . . . . . . . . . . . .  158
Number of Circles F Calculated for . . . . . . . .  137
Time Required for Search (seconds) . . . . . . . .  0.1
```


```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS
```


```
TABLE NO. 43
************************************************************
* Coordinate, Weight, Strength and Pore Water Pressure     *
* Information for Individual Slices for Conventional       *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the critical shear surface in the    *
* case of an automatic search.)                            *
************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. No.	Cohesion	Friction Angle	Pore Pressure
	96.37	889.00					
1	97.14	887.90	412	1	200.0	23.00	0.0
	97.90	886.81					
2	98.72	885.75	897	1	200.0	23.00	0.0
	99.53	884.70					
3	100.41	883.69	1421	1	200.0	23.00	0.0
	101.28	882.68					
4	101.44	882.50	321	1	200.0	23.00	0.0

	101.61	882.32					
5	101.80	882.11	397	1	200.0	23.00	10.2
	102.00	881.90					
6	102.50	881.39	1085	1	200.0	23.00	45.3
	103.00	880.88					
7	103.97	879.96	2316	1	200.0	23.00	120.3
	104.94	879.04					
8	105.96	878.18	2686	1	200.0	23.00	217.0
	106.97	877.31					
9	108.03	876.50	3034	1	200.0	23.00	306.3
	109.09	875.69					
10	110.20	874.93	3350	1	200.0	23.00	388.1
	111.30	874.18					
11	111.40	874.11	317	1	200.0	23.00	430.4
	111.50	874.05					
12	112.64	873.36	3651	1	200.0	23.00	451.6
	113.79	872.67					
13	114.96	872.04	3880	1	200.0	23.00	482.9
	116.14	871.41					
14	117.35	870.84	4059	1	200.0	23.00	505.0
	118.56	870.28					
15	118.88	870.14	1088	1	200.0	23.00	515.3
	119.20	870.00					
16	119.60	869.84	1352	2	100.0	25.00	518.3
	120.00	869.67					
17	121.25	869.21	4222	2	100.0	25.00	500.6
	122.50	868.74					
18	123.68	868.37	3924	2	100.0	25.00	459.5
	124.86	868.00					
19	126.15	867.66	4211	3	100.0	25.00	145.8
	127.44	867.33					
20	128.75	867.06	4117	3	100.0	25.00	183.5
	130.06	866.79					
21	131.38	866.59	3958	3	100.0	25.00	212.7
	132.70	866.39					
22	132.85	866.37	440	3	100.0	25.00	226.4
	133.00	866.35					
23	134.33	866.23	3705	3	100.0	25.00	235.1
	135.66	866.11					
24	136.99	866.06	3412	3	100.0	25.00	246.0
	138.33	866.00					
25	138.66	866.00	808	3	100.0	25.00	249.5
	139.00	866.00					
26	140.33	866.03	2961	3	100.0	25.00	247.4
	141.67	866.07					
27	143.00	866.17	2539	3	100.0	25.00	238.7
	144.33	866.28					
28	145.65	866.45	2066	3	100.0	25.00	221.3
	146.98	866.63					
29	148.29	866.87	1549	3	100.0	25.00	195.2
	149.60	867.11					
30	150.80	867.40	939	3	100.0	25.00	162.3
	152.00	867.68					
31	152.57	867.84	311	3	100.0	25.00	134.6
	153.14	868.00					
32	154.41	868.40	512	2	100.0	25.00	99.6
	155.69	868.81					
33	156.94	869.28	228	2	100.0	25.00	45.1
	158.19	869.75					
34	158.49	869.87	10	2	100.0	25.00	7.9
	158.80	870.00					

Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 44

```
**********************************************************
* Seismic Forces and Forces Due to Distributed Loads for *
* Individual Slices for Conventional Computations or the *
* First Stage of Multi-Stage Computations.               *
* (Information is for the critical shear surface in the  *
* case of an automatic search.)                          *
**********************************************************
```

There are no seismic forces or forces due to distributed loads for the current shear surface

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 47

```
**************************************************************
*  Information for the Iterative Solution for the Factor of  *
*  Safety and Side Force Inclination by Spencer's Procedure  *
**************************************************************
```

Allowable force imbalance for convergence: 7.0179e-001
Allowable moment imbalance for convergence: 87

```
        Trial     Trial
       Factor   Side Force     Force       Moment                    Delta
Iter-    of    Inclination   Imbalance    Imbalance    Delta-F       Theta
ation  Safety   (degrees)     (lbs.)     (ft.-lbs.)               (degrees)

   1   3.00000   -17.1887  -1.037e+004   9.000e+006
First-order corrections to F and Theta ............   -2.5748      0.3694
Reduced values - Deltas were too large ............   -0.5000      0.0717

   2   2.50000   -17.1170  -7.949e+003   6.900e+006
First-order corrections to F and Theta ............   -1.3721      0.4415
Reduced values - Deltas were too large ............   -0.5000      0.1609

   3   2.00000   -16.9561  -4.320e+003   3.748e+006
First-order corrections to F and Theta ............   -0.4812      0.6286
Second-order corrections to F and Theta ...........   -0.4099      1.4970

   4   1.59013   -15.4591   1.905e+002  -1.676e+005
First-order corrections to F and Theta ............    0.0109      0.2491
Second-order corrections to F and Theta ...........    0.0111      0.2332

   5   1.60125   -15.2259  -1.533e-002   1.141e+001
First-order corrections to F and Theta ............   -0.0000      0.0003
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS

Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 55
```
*********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)       *
*********************************************************************
```

Summation of Horizontal Forces: 6.52634e-012

Summation of Vertical Forces: 4.89209e-012

Summation of Moments: 2.18633e-004

Mohr Coulomb Shear Force/Shear Strength Check Summation: 4.05720e-012

***** CAUTION ***** Forces Between Slices are NEGATIVE at Points
Along the UPPER one-half of the Shear Surface -
A Tension Crack may Be Needed

***** CAUTION ***** Some of the Forces Between Slices Act at Points
Above the Surface of the Slope or Below the Shear Surface -
Either a Tension Crack may be Needed or the SOLUTION MAY NOT
BE A VALID SOLUTION

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 58
```
*************************************************************************
* Final Results for Stresses Along the Shear Surface                    *
* (Results are for the critical shear surface in the case of a search.) *
*************************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.601   Side Force Inclination: -15.23

-------- VALUES AT CENTER OF BASE OF SLICE --------

Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	97.14	887.90	70.0	70.0	143.5
2	98.72	885.75	259.7	259.7	193.8
3	100.41	883.69	453.9	453.9	245.2
4	101.44	882.50	572.5	572.5	276.7
5	101.80	882.11	613.8	603.6	284.9
6	102.50	881.39	676.5	631.2	292.2
7	103.97	879.96	787.7	667.4	301.8
8	105.96	878.18	925.7	708.8	312.8
9	108.03	876.50	1052.4	746.1	322.7
10	110.20	874.93	1166.5	778.4	331.3

11	111.40	874.11	1225.0	794.6	335.6
12	112.64	873.36	1274.2	822.6	343.0
13	114.96	872.04	1357.0	874.1	356.6
14	117.35	870.84	1424.7	919.8	368.7
15	118.88	870.14	1461.4	946.1	375.7
16	119.60	869.84	1479.3	961.0	342.3
17	121.25	869.21	1499.9	999.3	353.5
18	123.68	868.37	1520.3	1060.8	371.4
19	126.15	867.66	1526.8	1381.0	464.6
20	128.75	867.06	1519.4	1335.9	451.5
21	131.38	866.59	1490.6	1277.8	434.6
22	132.85	866.37	1467.1	1240.8	423.8
23	134.33	866.23	1431.9	1196.7	411.0
24	136.99	866.06	1354.1	1108.0	385.1
25	138.66	866.00	1295.0	1045.5	366.9
26	140.33	866.03	1221.4	973.9	346.1
27	143.00	866.17	1085.4	846.7	309.0
28	145.65	866.45	921.0	699.7	266.2
29	148.29	866.87	726.1	530.8	217.0
30	150.80	867.40	508.0	345.7	163.1
31	152.57	867.84	372.8	238.1	131.8
32	154.41	868.40	297.6	198.0	120.1
33	156.94	869.28	173.6	128.4	99.9
34	158.49	869.87	83.2	75.3	84.4

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-508 .dat

KCPL LA CYGNE UPPER AQC POND, SECTION P-508
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 59
****
* Final Results for Side Forces and Stresses Between Slices *
* (Results are for the critical shear surface in the case of a search.) *
****

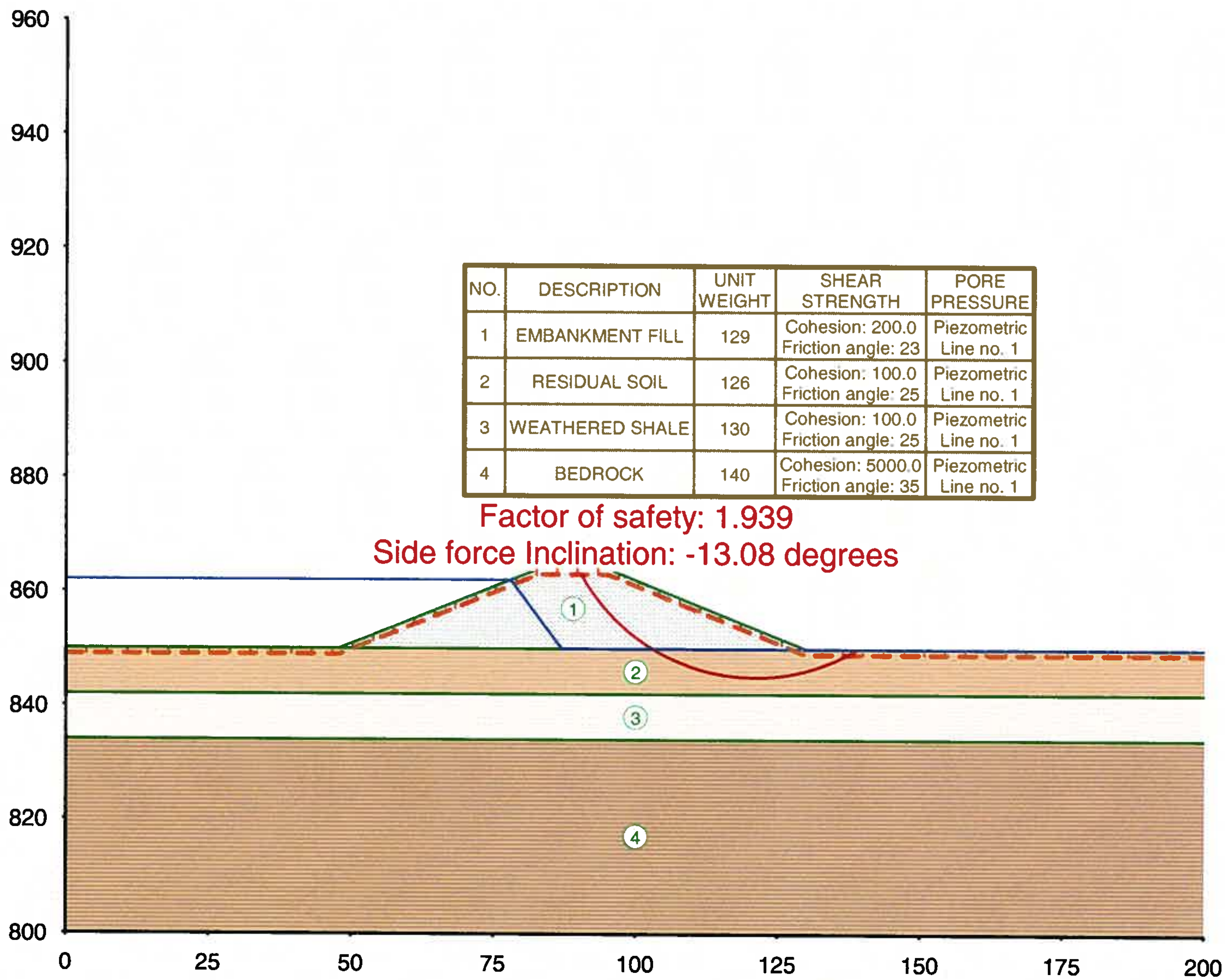
--------------- VALUES AT RIGHT SIDE OF SLICE ---------------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	97.90	-35	886.38	Below	29.8	-51.0
2	99.53	204	885.46	0.144	-42.2	116.6
3	101.28	712	883.89	0.166	-94.3	281.8
4	101.61	831	883.61	0.168	-103.4	312.0
5	102.00	980	883.28	0.170	-114.1	347.6
6	103.00	1396	882.49	0.185	-137.8	446.5
7	104.94	2286	881.08	0.208	-169.6	620.6
8	106.97	3288	879.72	0.225	-191.8	784.7
9	109.09	4347	878.43	0.239	-206.9	938.1
10	111.30	5414	877.20	0.250	-216.8	1080.3
11	111.50	5510	877.09	0.250	-217.5	1092.6
12	113.79	6520	875.94	0.259	-221.6	1218.9
13	116.14	7420	874.87	0.267	-219.9	1327.1
14	118.56	8171	873.87	0.274	-213.7	1417.3
15	119.20	8339	873.62	0.276	-211.4	1438.0
16	120.00	8559	873.31	0.277	-212.8	1470.9
17	122.50	9087	872.41	0.281	-211.9	1554.9

18	124.86	9350	871.66	0.285	-204.1	1607.5
19	127.44	9170	871.03	0.296	-157.1	1573.3
20	130.06	8792	870.47	0.307	-110.4	1525.8
21	132.70	8219	870.00	0.319	-61.8	1461.8
22	133.00	8142	869.95	0.320	-56.0	1453.3
23	135.66	7373	869.58	0.333	-2.3	1366.9
24	138.33	6456	869.30	0.348	59.6	1256.7
25	139.00	6206	869.25	0.353	77.1	1224.6
26	141.67	5160	869.10	0.376	157.2	1077.8
27	144.33	4072	869.06	0.410	264.8	892.7
28	146.98	3009	869.13	0.466	427.9	651.2
29	149.60	2052	869.31	0.570	731.6	298.5
30	152.00	1347	869.48	0.776	1490.5	-368.0
31	153.14	1069	869.56	0.778	1375.8	-344.5
32	155.69	503	869.77	0.807	1156.9	-343.0
33	158.19	75	869.96	0.829	854.1	-279.7
34	158.80	-0	870.00	1.000	0.0	0.0

Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.

KCPL LA CYGNE LOWER AQC POND, SECTION P-601



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	EMBANKMENT FILL	129	Cohesion: 200.0 Friction angle: 23	Piezometric Line no. 1
2	RESIDUAL SOIL	126	Cohesion: 100.0 Friction angle: 25	Piezometric Line no. 1
3	WEATHERED SHALE	130	Cohesion: 100.0 Friction angle: 25	Piezometric Line no. 1
4	BEDROCK	140	Cohesion: 5000.0 Friction angle: 35	Piezometric Line no. 1

Date: Tue Sep (Filename: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-601.UT4Time: 15:30:14

TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.0.1.5 - Last Revision Date: 2/15/2003


```
****************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE        *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE      *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA     *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE  *
* READ ALL DOCUMENTATION FOR THIS SOFTWARE BEFORE ATTEMPTING   *
* TO USE IT.  NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT   *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR    *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS    *
* OR ADAPTABILITY OF THIS SOFTWARE.                            *
****************************************************************
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 3

```
**************************
* NEW PROFILE LINE DATA *
**************************
```

----- Profile Line No. 1 - Material Type (Number): 1 -----

Description: EMBANKMENT FILL

Point	X	Y
1	48.00	850.00
2	78.00	862.00
3	83.00	864.00
4	95.00	864.00
5	130.00	850.00

----- Profile Line No. 2 - Material Type (Number): 2 -----

Description: RESIDUAL SOIL

Point	X	Y
1	0.00	850.00
2	200.00	850.00

----- Profile Line No. 3 - Material Type (Number): 3 -----

Description: WEATHERED SHALE

Point	X	Y
1	0.00	842.00

```
   2      200.00      842.00

-----------------------------------------------------------
----- Profile Line No. 4 - Material Type (Number): 4 -----
-----------------------------------------------------------
Description: BEDROCK

Point        X            Y

   1        0.00      834.00
   2      200.00      834.00
```

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 4
***********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
***********************************************************************

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
-------------------------------------------------------------------
Description: EMBANKMENT FILL

Unit weight of soil (material): 129.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 200.0
Friction angle - - - - - - 23.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
-------------------------------------------------------------------
Description: RESIDUAL SOIL

Unit weight of soil (material): 126.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 100.0
Friction angle - - - - - - 25.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
-------------------------------------------------------------------
Description: WEATHERED SHALE

Unit weight of soil (material): 130.0
```

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 100.0
Friction angle - - - - - 25.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

------------------ DATA FOR MATERIAL NUMBER 4 ------------------
----
Description: BEDROCK

Unit weight of soil (material): 140.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - 5000.0
Friction angle - - - - - 35.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 6
****
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
****

--------------- Piezometric Line Number 1 ---------------

Description: PIEZOMETRIC LINE FOR EMBANKMENT
Unit weight of fluid (water): 62.4

Point	X	Y
1	0.00	862.00
2	78.00	862.00
3	87.00	850.00
4	130.00	850.00
5	200.00	850.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 11
****
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *

```
*************************************************************************
                                         Normal        Shear
Point       X           Y               Pressure       Stress

Distributed loads will be generated from piezometric line number 1
See Output Table number 27

UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 16
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************

Starting Center Coordinate for Search at -
                                             X: 110.00
                                             Y: 910.00

Required accuracy for critical center
(= minimum spacing between grid points): 1.000

No center allowed to pass below: 880.00

Critical shear surface not allowed to pass below Y: 834.00
For the initial mode of search circles are tangent to horizontal line at -
                                             Y: 842.00
                                             Radius: 68.00


Depth of crack: 1.000

Depth of water (or other fluid) in crack: 1.000
Automatic search output will be in short form.
Procedure of Analysis: Spencer

--------------------------------------------------------------------------------
The following represent default values or values that were prevously defined:
Subtended angle for slice subdivision: 3.00(degrees)
Conventional (single-stage) computations will be performed.
Seismic coefficient: 0.000
Unit weight of water (or other fluid) in crack: 62.4
Search will be continued after the initial mode to find a most critical circle.
Maximum number of trial grids for a given search mode: 50
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Standard sign convention used for direction of shear stress on shear surface.
Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
Minimum weight required for computations to be performed: 100
Initial trial factor of safety: 3.000
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure:
-10.00
```

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 26
*************************************
* NEW, COMPUTED SLOPE GEOMETRY DATA *
*************************************

These slope geometry were generated from the Profile Lines.

     Point        X           Y

       1         0.00       850.00
       2        48.00       850.00
       3        78.00       862.00
       4        83.00       864.00
       5        95.00       864.00
       6       130.00       850.00
       7       200.00       850.00
```



```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS
```



```
TABLE NO. 27
*********************************************************************
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************
                                      Normal         Shear
Point        X           Y           Pressure        Stress

   1        0.00       850.00         748.8            0.0
   2       48.00       850.00         748.8            0.0
   3       78.00       862.00           0.0            0.0

The above data were generated automatically from piezometric
line number 1.

Search will be conducted for RIGHT face of slope
```



```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS
```



```
TABLE NO. 32
**************************************************************
```

```
* SHORT-FORM OUTPUT FOR TYPE 1 AUTOMATIC SEARCH WITH CIRCLES *
**************************************************************

                         Center Coordinates of                1-Stage
                            Critical Circle                   Factor   Side
                                                                of     Force
Mode of Search                  X         Y        Radius     Safety  Inclin.
   Messages


Circles tangent to horiz.    121.00    880.00     38.000     1.991  -10.61
line at Y = 842.00


************************************************************
CAUTION - THE FACTOR OF SAFETY COULD NOT BE COMPUTED
FOR SOME OF THE GRID POINTS AROUND THE MINIMUM
************************************************************

Circles all have the same    122.00    883.00     38.000     1.947  -12.72
radius = 38.000


Circles tangent to horiz.    121.00    880.00     35.000     1.939  -13.08
line at Y = 845.00


************************************************************
CAUTION - THE FACTOR OF SAFETY COULD NOT BE COMPUTED
FOR SOME OF THE GRID POINTS AROUND THE MINIMUM
************************************************************

Circles all have the same    121.00    880.00     35.000     1.939  -13.08
radius = 35.000


************************************************************
CAUTION - THE FACTOR OF SAFETY COULD NOT BE COMPUTED
FOR SOME OF THE GRID POINTS AROUND THE MINIMUM
************************************************************

UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 33
*********************************************
* 1-STAGE FINAL CRITICAL CIRCLE INFORMATION *
*********************************************

CAUTION - THE FACTOR OF SAFETY COULD NOT BE COMPUTED
FOR SOME OF THE GRID POINTS AROUND THE MINIMUM
X Coordinate of Center . . . . . . . . . . . . . .  121.00
Y Coordinate of Center . . . . . . . . . . . . . .  880.00
Radius . . . . . . . . . . . . . . . . . . . . . .  35.00
Factor of Safety . . . . . . . . . . . . . . . . . 1.939
Side Force Inclination (degrees) . . . . . . . . . -13.08
Number of Circles Tried  . . . . . . . . . . . . .  158
```

```
Number of Circles F Calculated for . . . . . . .  91
Time Required for Search (seconds) . . . . . . .  0.1

UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 43
**************************************************************
* Coordinate, Weight, Strength and Pore Water Pressure       *
* Information for Individual Slices for Conventional         *
* Computations or First Stage of Multi-Stage Computations.   *
* (Information is for the critical shear surface in the      *
* case of an automatic search.)                              *
**************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. No.	Cohesion	Friction Angle	Pore Pressure
	90.41	863.00					
1	90.87	862.21	215	1	200.0	23.00	0.0
	91.34	861.42					
2	91.84	860.66	437	1	200.0	23.00	0.0
	92.35	859.90					
3	92.90	859.16	682	1	200.0	23.00	0.0
	93.44	858.42					
4	94.03	857.72	946	1	200.0	23.00	0.0
	94.61	857.01					
5	94.80	856.79	364	1	200.0	23.00	0.0
	95.00	856.57					
6	95.63	855.90	1277	1	200.0	23.00	0.0
	96.26	855.24					
7	96.93	854.61	1478	1	200.0	23.00	0.0
	97.59	853.98					
8	98.29	853.39	1672	1	200.0	23.00	0.0
	98.99	852.79					
9	99.71	852.23	1854	1	200.0	23.00	0.0
	100.44	851.68					
10	101.19	851.16	2020	1	200.0	23.00	0.0
	101.95	850.64					
11	102.46	850.32	1410	1	200.0	23.00	0.0
	102.97	850.00					
12	103.77	849.55	2249	2	100.0	25.00	28.2
	104.57	849.10					
13	105.39	848.69	2354	2	100.0	25.00	81.8
	106.21	848.28					
14	107.05	847.91	2432	2	100.0	25.00	130.1
	107.89	847.55					
15	108.75	847.23	2482	2	100.0	25.00	173.0
	109.60	846.91					
16	110.48	846.63	2502	2	100.0	25.00	210.2
	111.35	846.36					
17	112.24	846.13	2492	2	100.0	25.00	241.7
	113.13	845.90					
18	114.02	845.71	2450	2	100.0	25.00	267.4
	114.92	845.53					
19	115.83	845.40	2377	2	100.0	25.00	287.3
	116.73	845.26					
20	117.64	845.17	2272	2	100.0	25.00	301.2

```
         118.56     845.09
   21    119.47     845.05              2137     2         100.0     25.00          309.2
         120.39     845.01
   22    120.69     845.00               680     2         100.0     25.00          311.8
         121.00     845.00
   23    121.92     845.02              1913     2         100.0     25.00          310.5
         122.83     845.05
   24    123.75     845.12              1713     2         100.0     25.00          304.5
         124.66     845.19
   25    125.57     845.31              1489     2         100.0     25.00          292.6
         126.48     845.43
   26    127.38     845.60              1243     2         100.0     25.00          274.7
         128.28     845.76
   27    129.14     845.97               951     2         100.0     25.00          251.4
         130.00     846.18
   28    130.88     846.44               789     2         100.0     25.00          222.4
         131.76     846.69
   29    132.62     847.00               654     2         100.0     25.00          187.3
         133.49     847.30
   30    134.33     847.65               501     2         100.0     25.00          146.5
         135.18     848.00
   31    136.01     848.39               335     2         100.0     25.00          100.2
         136.84     848.79
   32    137.64     849.22               158     2         100.0     25.00           48.5
         138.45     849.66
   33    138.74     849.83                12     2         100.0     25.00           10.6
         139.03     850.00
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 44

```
*********************************************************
* Seismic Forces and Forces Due to Distributed Loads for *
* Individual Slices for Conventional Computations or the *
* First Stage of Multi-Stage Computations.               *
* (Information is for the critical shear surface in the  *
* case of an automatic search.)                          *
*********************************************************
```

There are no seismic forces or forces due to distributed loads
for the current shear surface

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 47

```
*************************************************************
*  Information for the Iterative Solution for the Factor of  *
*  Safety and Side Force Inclination by Spencer's Procedure  *
*************************************************************
```

```
Allowable force imbalance for convergence:  4.6538e-001
Allowable moment imbalance for convergence: 52

         Trial      Trial
        Factor   Side Force      Force        Moment                 Delta
Iter-     of     Inclination   Imbalance    Imbalance     Delta-F    Theta
ation   Safety    (degrees)      (lbs.)     (ft.-lbs.)              (degrees)

   1   3.00000   -17.1887  -4.571e+003   3.846e+006
First-order corrections to F and Theta ............   -1.5230     0.9239
Reduced values - Deltas were too large ............   -0.5000     0.3033

   2   2.50000   -16.8854  -2.763e+003   2.322e+006
First-order corrections to F and Theta ............   -0.6553     1.2603
Reduced values - Deltas were too large ............   -0.5000     0.9616

   3   2.00000   -15.9238  -1.075e+002   8.156e+004
First-order corrections to F and Theta ............   -0.0599     2.6044
Second-order corrections to F and Theta ...........   -0.0614     2.8505

   4   1.93861   -13.0733  -1.882e-001   1.692e+002
First-order corrections to F and Theta ............    0.0000    -0.0027
Second-order corrections to F and Theta ...........    0.0000    -0.0027

   5   1.93863   -13.0759   7.897e-010  -4.805e-007
First-order corrections to F and Theta ............    0.0000    -0.0000
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

```
TABLE NO. 55
*********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)       *
*********************************************************************
```

Summation of Horizontal Forces: 4.60076e-012

Summation of Vertical Forces: 3.87423e-012

Summation of Moments: 3.55067e-009

Mohr Coulomb Shear Force/Shear Strength Check Summation: 1.96820e-012

***** CAUTION ***** Forces Between Slices are NEGATIVE at Points
Along the UPPER one-half of the Shear Surface -
A Tension Crack may Be Needed

***** CAUTION ***** Some of the Forces Between Slices Act at Points
Above the Surface of the Slope or Below the Shear Surface -
Either a Tension Crack may be Needed or the SOLUTION MAY NOT
BE A VALID SOLUTION

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope

Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 58
****
* Final Results for Stresses Along the Shear Surface *
* (Results are for the critical shear surface in the case of a search.) *
****

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.939 Side Force Inclination: -13.08

-------- VALUES AT CENTER OF BASE OF SLICE --------

Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	90.87	862.21	42.2	42.2	112.4
2	91.84	860.66	183.8	183.8	143.4
3	92.90	859.16	327.0	327.0	174.8
4	94.03	857.72	474.5	474.5	207.1
5	94.80	856.79	574.3	574.3	228.9
6	95.63	855.90	650.9	650.9	245.7
7	96.93	854.61	753.8	753.8	268.2
8	98.29	853.39	851.1	851.1	289.5
9	99.71	852.23	941.8	941.8	309.4
10	101.19	851.16	1024.8	1024.8	327.6
11	102.46	850.32	1088.0	1088.0	341.4
12	103.77	849.55	1151.6	1123.5	321.8
13	105.39	848.69	1209.2	1127.4	322.8
14	107.05	847.91	1255.1	1125.0	322.2
15	108.75	847.23	1288.7	1115.8	320.0
16	110.48	846.63	1309.6	1099.4	316.0
17	112.24	846.13	1317.2	1075.5	310.3
18	114.02	845.71	1311.1	1043.7	302.6
19	115.83	845.40	1290.8	1003.5	293.0
20	117.64	845.17	1255.8	954.6	281.2
21	119.47	845.05	1205.7	896.5	267.2
22	120.69	845.00	1164.9	853.1	256.8
23	121.92	845.02	1114.2	803.7	244.9
24	123.75	845.12	1026.5	721.9	225.2
25	125.57	845.31	921.5	629.0	202.9
26	127.38	845.60	798.6	523.9	177.6
27	129.14	845.97	659.3	407.9	149.7
28	130.88	846.44	556.7	334.2	132.0
29	132.62	847.00	491.2	303.9	124.7
30	134.33	847.65	408.9	262.4	114.7
31	136.01	848.39	308.2	208.0	101.6
32	137.64	849.22	187.0	138.5	84.9
33	138.74	849.83	92.6	82.0	71.3

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-601.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-601
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 59

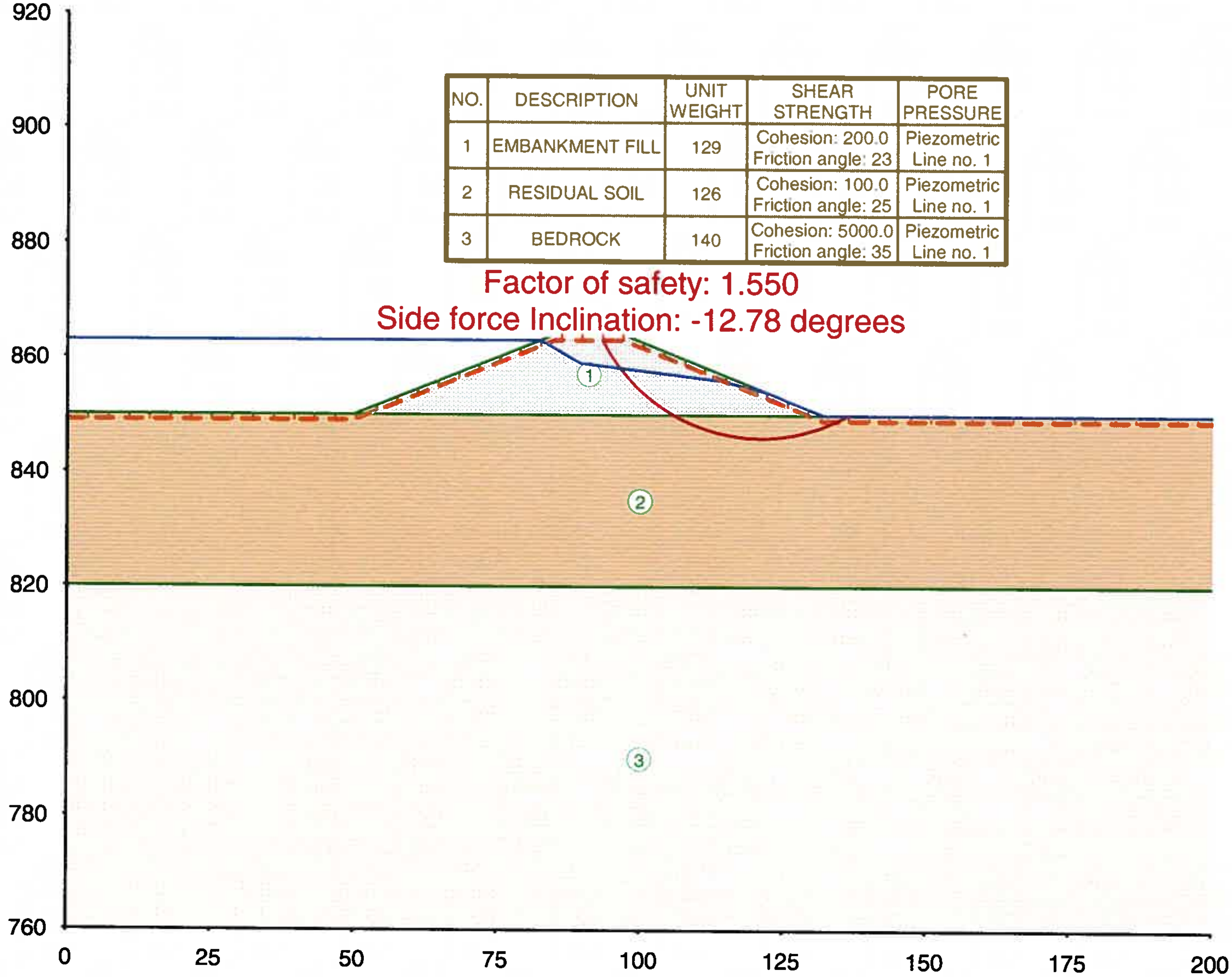
```
***************************************************************************
* Final Results for Side Forces and Stresses Between Slices              *
* (Results are for the critical shear surface in the case of a search.) *
***************************************************************************
```

--------------- VALUES AT RIGHT SIDE OF SLICE ---------------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	91.34	-7	857.10	Below	32.7	-38.2
2	92.35	132	860.74	0.206	-23.9	86.4
3	93.44	430	859.48	0.189	-64.9	215.2
4	94.61	870	858.39	0.197	-99.5	342.0
5	95.00	1039	858.04	0.198	-110.3	382.5
6	96.26	1608	857.04	0.219	-130.7	510.2
7	97.59	2218	856.11	0.237	-139.0	619.9
8	98.99	2843	855.22	0.253	-139.0	714.9
9	100.44	3459	854.38	0.267	-132.8	796.7
10	101.95	4042	853.59	0.279	-121.2	865.4
11	102.97	4397	853.10	0.287	-110.9	903.2
12	104.57	4937	852.36	0.295	-100.9	969.2
13	106.21	5408	851.68	0.302	-87.5	1025.1
14	107.89	5794	851.05	0.310	-70.6	1069.9
15	109.60	6080	850.48	0.318	-49.9	1102.6
16	111.35	6254	849.97	0.326	-25.1	1122.4
17	113.13	6309	849.53	0.335	4.3	1128.3
18	114.92	6243	849.15	0.345	39.0	1119.4
19	116.73	6057	848.84	0.356	79.9	1094.7
20	118.56	5757	848.59	0.370	128.6	1052.9
21	120.39	5354	848.42	0.386	187.4	992.5
22	121.00	5199	848.38	0.393	209.8	967.8
23	122.83	4683	848.30	0.416	287.9	878.9
24	124.66	4109	848.29	0.446	388.8	764.0
25	126.48	3505	848.34	0.487	526.3	615.6
26	128.28	2902	848.45	0.545	730.2	418.1
27	130.00	2359	848.58	0.627	1060.1	141.8
28	131.76	1825	848.73	0.617	914.6	160.9
29	133.49	1297	848.96	0.613	786.2	150.4
30	135.18	804	849.24	0.621	675.6	108.1
31	136.84	383	849.58	0.653	589.0	25.9
32	138.45	75	849.90	0.698	467.4	-39.6
33	139.03	-0	850.00	1.000	0.0	0.0

Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.

KCPL LA CYGNE LOWER AQC POND, SECTION P-603



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	EMBANKMENT FILL	129	Cohesion: 200.0 Friction angle: 23	Piezometric Line no. 1
2	RESIDUAL SOIL	126	Cohesion: 100.0 Friction angle: 25	Piezometric Line no. 1
3	BEDROCK	140	Cohesion: 5000.0 Friction angle: 35	Piezometric Line no. 1

Date: Tue Sep (Filename: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.UT4Time: 15:21:33

```
TABLE NO. 1
COMPUTER PROGRAM DESIGNATION: UTEXAS4
Originally Coded By Stephen G. Wright
Version No. 4.0.1.5 - Last Revision Date: 2/15/2003
(C) Copyright 1985-2002 S. G. Wright - All rights reserved
*******************************************************************
* RESULTS OF COMPUTATIONS PERFORMED USING THIS SOFTWARE           *
* SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY HAVE         *
* BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL DATA        *
* OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE ALGORITHMS *
* AND ANALYTICAL PROCEDURES USED IN THIS SOFTWARE AND MUST HAVE  *
* READ ALL DOCUMENTATION FOR THIS SOFTWARE BEFORE ATTEMPTING      *
* TO USE IT.  NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT      *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR       *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS       *
* OR ADAPTABILITY OF THIS SOFTWARE.                               *
*******************************************************************

UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 3
**************************
* NEW PROFILE LINE DATA *
**************************

-----------------------------------------------------------
----- Profile Line No. 1 - Material Type (Number): 1 -----
-----------------------------------------------------------
Description: EMBANKMENT FILL

Point        X            Y

   1       50.00       850.00
   2       82.50       863.00
   3       85.00       864.00
   4       97.00       864.00
   5      122.00       854.00
   6      132.00       850.00

-----------------------------------------------------------
----- Profile Line No. 2 - Material Type (Number): 2 -----
-----------------------------------------------------------
Description: RESIDUAL SOIL

Point        X            Y

   1        0.00       850.00
   2       50.00       850.00
   3      132.00       850.00
   4      200.00       850.00

-----------------------------------------------------------
----- Profile Line No. 3 - Material Type (Number): 3 -----
-----------------------------------------------------------
Description: BEDROCK
```

```
Point         X            Y

   1        0.00       820.00
   2      200.00       820.00
```

```
UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 4
***********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
***********************************************************************

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 1 -------------------
-------------------------------------------------------------------
Description: EMBANKMENT FILL

Unit weight of soil (material): 129.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 200.0
Friction angle - - - - - 23.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 2 -------------------
-------------------------------------------------------------------
Description: RESIDUAL SOIL

Unit weight of soil (material): 126.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 100.0
Friction angle - - - - - 25.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.

-------------------------------------------------------------------
------------------- DATA FOR MATERIAL NUMBER 3 -------------------
-------------------------------------------------------------------
Description: BEDROCK

Unit weight of soil (material): 140.0

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 5000.0
Friction angle - - - - - 35.00 (degrees)

Pore water pressures are defined by a piezometric line.
Piezometric line number: 1
Negative pore water pressures are NOT allowed - set to zero.
```

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 6

```
*********************************************************************
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************
```

```
---------------------------------------------------------
--------------- Piezometric Line Number 1 ---------------
---------------------------------------------------------
```

Description: PIEZOMETRIC LINE FOR EMBANKMENT
Unit weight of fluid (water): 62.4

Point	X	Y
1	0.00	863.00
2	82.50	863.00
3	89.50	859.00
4	114.00	856.00
5	122.00	854.00
6	132.00	850.00
7	200.00	850.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 11

```
*********************************************************************
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************
```

Point	X	Y	Normal Pressure	Shear Stress

Distributed loads will be generated from piezometric line number 1
See Output Table number 27

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 16

```
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
```

****

Starting Center Coordinate for Search at -
X: 125.00
Y: 875.00

Required accuracy for critical center
(= minimum spacing between grid points): 1.000

No center allowed to pass below: 860.00

Critical shear surface not allowed to pass below Y: 820.00
For the initial mode of search circles are tangent to horizontal line at -
Y: 839.00
Radius: 36.00

Depth of crack: 1.000

Depth of water (or other fluid) in crack: 1.000
Automatic search output will be in short form.
Procedure of Analysis: Spencer

The following represent default values or values that were prevously defined:
Subtended angle for slice subdivision: 3.00(degrees)
Conventional (single-stage) computations will be performed.
Seismic coefficient: 0.000
Unit weight of water (or other fluid) in crack: 62.4
Search will be continued after the initial mode to find a most critical circle.
Maximum number of trial grids for a given search mode: 50
No restrictions exist on the lateral extent of the search.
No shear surfaces other than the most critical will be saved for display later.
Neither slope face was explicitly designated for analysis.
Standard sign convention used for direction of shear stress on shear surface.
Iteration limit: 100
Force imbalance: 1.000000e-005 (fraction of total weight)
Moment imbalance: 1.000000e-005 (fraction of moment due to total weight)
Minimum weight required for computations to be performed: 100
Initial trial factor of safety: 3.000
Initial trial side force inclination: 17.189 (degrees)
Minimum (most negative) side force inclination allowed in Spencer's procedure:
-10.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 26
****
* NEW, COMPUTED SLOPE GEOMETRY DATA *
****

These slope geometry were generated from the Profile Lines.

Point	X	Y
1	0.00	850.00

2	50.00	850.00
3	82.50	863.00
4	85.00	864.00
5	97.00	864.00
6	122.00	854.00
7	132.00	850.00
8	200.00	850.00

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 27
****
* NEW DISTRIBUTED LOAD DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
****

Point	X	Y	Normal Pressure	Shear Stress
1	0.00	850.00	811.2	0.0
2	50.00	850.00	811.2	0.0
3	82.50	863.00	0.0	0.0

The above data were generated automatically from piezometric line number 1.

Search will be conducted for RIGHT face of slope

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 32
****
* SHORT-FORM OUTPUT FOR TYPE 1 AUTOMATIC SEARCH WITH CIRCLES *
****

Mode of Search Messages	Center Coordinates of Critical Circle X	Y	Radius	1-Stage Factor of Safety	Side Force Inclin.
Circles tangent to horiz. line at Y = 839.00	121.00	879.00	40.000	1.748	-8.64
Circles all have the same radius = 40.000	123.00	886.00	40.000	1.580	-11.88
Circles tangent to horiz.	121.00	877.00	31.000	1.550	-12.78

line at Y = 846.00

Circles all have the same radius = 31.000 121.00 877.00 31.000 1.550 -12.78

□
UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 33
****
* 1-STAGE FINAL CRITICAL CIRCLE INFORMATION *
****
X Coordinate of Center 121.00
Y Coordinate of Center 877.00
Radius 31.00
Factor of Safety 1.550
Side Force Inclination (degrees) . . . . -12.78
Number of Circles Tried 170
Number of Circles F Calculated for 140
Time Required for Search (seconds) 0.2
□
UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 43
****
* Coordinate, Weight, Strength and Pore Water Pressure *
* Information for Individual Slices for Conventional *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the critical shear surface in the *
* case of an automatic search.) *
****

Slice No.	X	Y	Slice Weight	Matl. No.	Cohesion	Friction Angle	Pore Pressure
	93.34	863.00					
1	93.73	862.29	170	1	200.0	23.00	0.0
	94.11	861.57					
2	94.53	860.88	340	1	200.0	23.00	0.0
	94.96	860.19					
3	95.41	859.52	530	1	200.0	23.00	0.0
	95.87	858.85					
4	96.13	858.50	363	1	200.0	23.00	0.0
	96.38	858.16					
5	96.69	857.77	495	1	200.0	23.00	21.9
	97.00	857.38					
6	97.53	856.76	960	1	200.0	23.00	78.2
	98.06	856.15					
7	98.62	855.56	1128	1	200.0	23.00	144.8

	99.18	854.98					
8	99.77	854.42	1292	1	200.0	23.00	207.2
	100.36	853.87					
9	100.98	853.34	1449	1	200.0	23.00	265.3
	101.60	852.82					
10	102.25	852.33	1596	1	200.0	23.00	319.0
	102.90	851.84					
11	103.57	851.38	1730	1	200.0	23.00	368.1
	104.24	850.92					
12	104.93	850.50	1848	1	200.0	23.00	412.4
	105.63	850.08					
13	105.70	850.04	193	1	200.0	23.00	435.3
	105.77	850.00					
14	106.49	849.62	1957	2	100.0	25.00	455.5
	107.20	849.24					
15	107.94	848.90	2032	2	100.0	25.00	489.5
	108.67	848.56					
16	109.43	848.25	2085	2	100.0	25.00	518.4
	110.18	847.95					
17	110.95	847.69	2115	2	100.0	25.00	542.1
	111.71	847.42					
18	112.50	847.20	2121	2	100.0	25.00	560.6
	113.28	846.98					
19	113.64	846.89	970	2	100.0	25.00	571.3
	114.00	846.80					
20	114.80	846.64	2085	2	100.0	25.00	571.8
	115.59	846.48					
21	116.39	846.36	2030	2	100.0	25.00	564.5
	117.20	846.23					
22	118.00	846.16	1949	2	100.0	25.00	551.8
	118.81	846.08					
23	119.62	846.04	1844	2	100.0	25.00	533.7
	120.43	846.01					
24	120.72	846.00	617	2	100.0	25.00	519.1
	121.00	846.00					
25	121.50	846.01	1045	2	100.0	25.00	506.5
	122.00	846.02					
26	122.81	846.06	1572	2	100.0	25.00	475.0
	123.62	846.11					
27	124.43	846.20	1403	2	100.0	25.00	426.1
	125.23	846.29					
28	126.03	846.42	1215	2	100.0	25.00	372.2
	126.83	846.55					
29	127.63	846.73	1011	2	100.0	25.00	313.3
	128.42	846.90					
30	129.20	847.12	795	2	100.0	25.00	249.8
	129.99	847.33					
31	130.76	847.59	567	2	100.0	25.00	181.7
	131.53	847.84					
32	131.76	847.93	130	2	100.0	25.00	135.1
	132.00	848.02					
33	132.75	848.32	317	2	100.0	25.00	104.5
	133.50	848.63					
34	134.24	848.98	189	2	100.0	25.00	63.7
	134.97	849.33					
35	135.60	849.66	54	2	100.0	25.00	21.0
	136.23	850.00					

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

```
KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 44
**********************************************************
* Seismic Forces and Forces Due to Distributed Loads for *
* Individual Slices for Conventional Computations or the *
* First Stage of Multi-Stage Computations.               *
* (Information is for the critical shear surface in the  *
* case of an automatic search.)                          *
**********************************************************

There are no seismic forces or forces due to distributed loads
for the current shear surface

UTEXAS4 S/N:00142  - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope
Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 47
**************************************************************
*  Information for the Iterative Solution for the Factor of  *
*  Safety and Side Force Inclination by Spencer's Procedure  *
**************************************************************
Allowable force imbalance for convergence:  4.0197e-001
Allowable moment imbalance for convergence: 45

        Trial     Trial
       Factor   Side Force     Force       Moment                 Delta
Iter-    of    Inclination   Imbalance    Imbalance    Delta-F     Theta
ation  Safety   (degrees)     (lbs.)     (ft.-lbs.)              (degrees)

   1   3.00000   -17.1887  -5.786e+003   4.881e+006
First-order corrections to F and Theta ............   -2.6394     0.6514
Reduced values - Deltas were too large ............   -0.5000     0.1234

   2   2.50000   -17.0653  -4.468e+003   3.768e+006
First-order corrections to F and Theta ............   -1.4210     0.7952
Reduced values - Deltas were too large ............   -0.5000     0.2798

   3   2.00000   -16.7855  -2.494e+003   2.101e+006
First-order corrections to F and Theta ............   -0.5200     1.1840
Reduced values - Deltas were too large ............   -0.5000     1.1386

   4   1.50000   -15.6470   7.333e+002  -6.298e+005
First-order corrections to F and Theta ............   -0.0043     6.8136
Reduced values - Deltas were too large ............   -0.0018     2.8648

   5   1.49820   -12.7822   4.406e+002  -3.763e+005
First-order corrections to F and Theta ............    0.0503     0.0059
Second-order corrections to F and Theta ...........    0.0522     0.0039

   6   1.55039   -12.7782  -5.493e-001   4.690e+002
First-order corrections to F and Theta ............   -0.0001     0.0001
Second-order corrections to F and Theta ...........   -0.0001     0.0001

   7   1.55032   -12.7782   1.068e-009  -9.124e-007
```

First-order corrections to F and Theta 0.0000   0.0000
▯
UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 55
```
*********************************************************************
* Check of Computations by Spencer's Procedure (Results are for the *
* critical shear surface in the case of an automatic search.)       *
*********************************************************************
```

Summation of Horizontal Forces: 4.13181e-012

Summation of Vertical Forces: 4.25615e-012

Summation of Moments: -4.65661e-010

Mohr Coulomb Shear Force/Shear Strength Check Summation: 1.64846e-012

***** CAUTION ***** Forces Between Slices are NEGATIVE at Points
Along the UPPER one-half of the Shear Surface -
A Tension Crack may Be Needed

***** CAUTION ***** Some of the Forces Between Slices Act at Points
Above the Surface of the Slope or Below the Shear Surface -
Either a Tension Crack may be Needed or the SOLUTION MAY NOT
BE A VALID SOLUTION
▯
UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 58
```
*************************************************************************
* Final Results for Stresses Along the Shear Surface                    *
* (Results are for the critical shear surface in the case of a search.) *
*************************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE THE FACTOR OF SAFETY
Factor of Safety: 1.550   Side Force Inclination: -12.78

-------- VALUES AT CENTER OF BASE OF SLICE --------

Slice No.	X-Center	Y-Center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	93.73	862.29	1.1	1.1	129.3
2	94.53	860.88	125.1	125.1	163.3
3	95.41	859.52	250.8	250.8	197.7
4	96.13	858.50	350.8	350.8	225.1
5	96.69	857.77	430.7	408.7	240.9
6	97.53	856.76	530.6	452.4	252.9

7	98.62	855.56	637.9	493.1	264.0
8	99.77	854.42	739.0	531.8	274.6
9	100.98	853.34	833.3	567.9	284.5
10	102.25	852.33	919.9	600.9	293.5
11	103.57	851.38	998.4	630.3	301.6
12	104.93	850.50	1068.0	655.6	308.5
13	105.70	850.04	1103.6	668.3	312.0
14	106.49	849.62	1144.4	688.9	271.7
15	107.94	848.90	1189.6	700.1	275.1
16	109.43	848.25	1224.5	706.1	276.9
17	110.95	847.69	1248.5	706.5	277.0
18	112.50	847.20	1261.4	700.8	275.3
19	113.64	846.89	1264.5	693.2	273.0
20	114.80	846.64	1259.1	687.3	271.2
21	116.39	846.36	1242.8	678.2	268.5
22	118.00	846.16	1214.0	662.2	263.7
23	119.62	846.04	1172.5	638.7	256.6
24	120.72	846.00	1138.1	619.1	250.7
25	121.50	846.01	1108.5	602.0	245.6
26	122.81	846.06	1052.1	577.1	238.1
27	124.43	846.20	971.2	545.1	228.5
28	126.03	846.42	875.9	503.7	216.0
29	127.63	846.73	765.3	452.0	200.4
30	129.20	847.12	638.4	388.6	181.4
31	130.76	847.59	494.0	312.3	158.4
32	131.76	847.93	390.2	255.1	141.2
33	132.75	848.32	324.4	219.8	130.6
34	134.24	848.98	234.9	171.2	116.0
35	135.60	849.66	133.4	112.4	98.3

UTEXAS4 S/N:00142 - Version: 4.0.1.5 - Latest Revision: 2/15/2003
Licensed for use by: , URS Corp., Overland Park, KS
Time and date of run: Tue Sep 07 16:39:42 2010
Name of input data file: I:\16530629 LaCgyne AQC Pond Geotech\AQC Pond Slope Stability\Section P-603.dat

KCPL LA CYGNE LOWER AQC POND, SECTION P-603
DATA FOR STEADY-STATE SEEPAGE STABILITY CALCULATIONS

TABLE NO. 59
****
* Final Results for Side Forces and Stresses Between Slices *
* (Results are for the critical shear surface in the case of a search.) *
****

--------------- VALUES AT RIGHT SIDE OF SLICE ---------------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	94.11	-69	861.71	0.057	45.7	-100.7
2	94.96	-32	862.35	0.568	-11.6	-4.8
3	95.87	127	858.72	Below	-51.5	99.5
4	96.38	256	858.52	0.063	-69.5	155.1
5	97.00	448	858.09	0.107	-89.4	221.4
6	98.06	842	857.29	0.153	-119.6	340.8
7	99.18	1305	856.47	0.183	-141.2	453.5
8	100.36	1814	855.66	0.204	-155.9	558.5
9	101.60	2348	854.88	0.221	-164.9	655.2
10	102.90	2886	854.14	0.235	-168.9	742.9
11	104.24	3405	853.44	0.247	-168.6	820.9
12	105.63	3888	852.78	0.258	-164.2	888.6

13	105.77	3934	852.72	0.259	-163.5	894.8
14	107.20	4426	852.06	0.264	-167.1	975.6
15	108.67	4846	851.47	0.271	-165.3	1042.5
16	110.18	5179	850.93	0.277	-159.0	1096.3
17	111.71	5417	850.45	0.283	-149.0	1137.3
18	113.28	5553	850.02	0.289	-135.6	1165.9
19	114.00	5580	849.84	0.292	-128.4	1174.9
20	115.59	5557	849.49	0.299	-110.2	1184.6
21	117.20	5423	849.20	0.306	-88.2	1180.0
22	118.81	5181	848.97	0.314	-62.3	1160.9
23	120.43	4841	848.79	0.324	-32.2	1127.4
24	121.00	4701	848.75	0.327	-20.6	1112.3
25	122.00	4431	848.68	0.334	1.2	1081.4
26	123.62	3934	848.62	0.347	42.2	1017.3
27	125.23	3377	848.62	0.364	93.4	933.1
28	126.83	2785	848.69	0.387	159.9	825.7
29	128.42	2187	848.82	0.423	253.1	688.4
30	129.99	1615	849.00	0.481	401.7	504.6
31	131.53	1106	849.22	0.589	704.7	213.8
32	132.00	967	849.30	0.645	888.7	62.4
33	133.50	561	849.53	0.659	782.8	17.4
34	134.97	219	849.81	0.712	722.0	-87.0
35	136.23	0	850.00	0.000	0.0	0.0

Read end-of-file on input while looking for another command word.
End of input data assumed - normal termination.

N

1700 0 1700

SCALE IN FEET

URS
8300 College Blvd., Suite 200
Overland Park, Kansas 66210

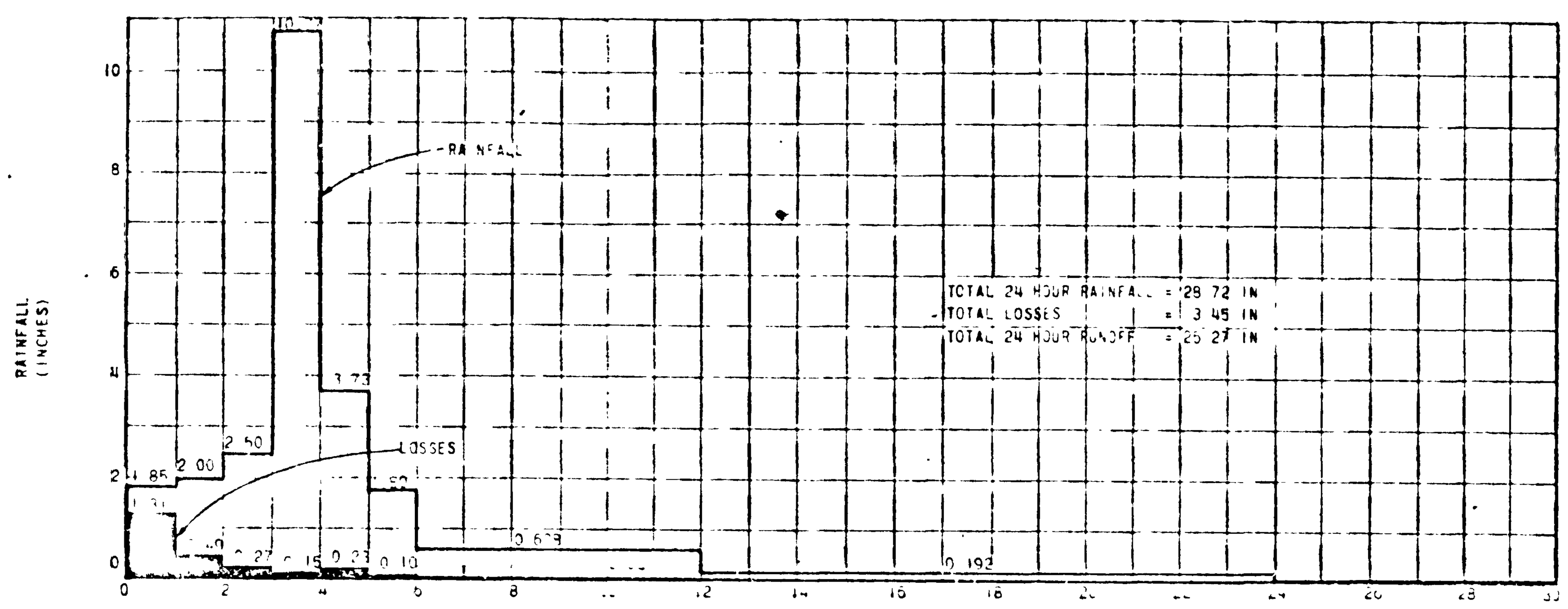
CLIENT: KANSAS CITY POWER & LIGHT COMPANY

LOCATION: LA CYGNE GENERATING STATION

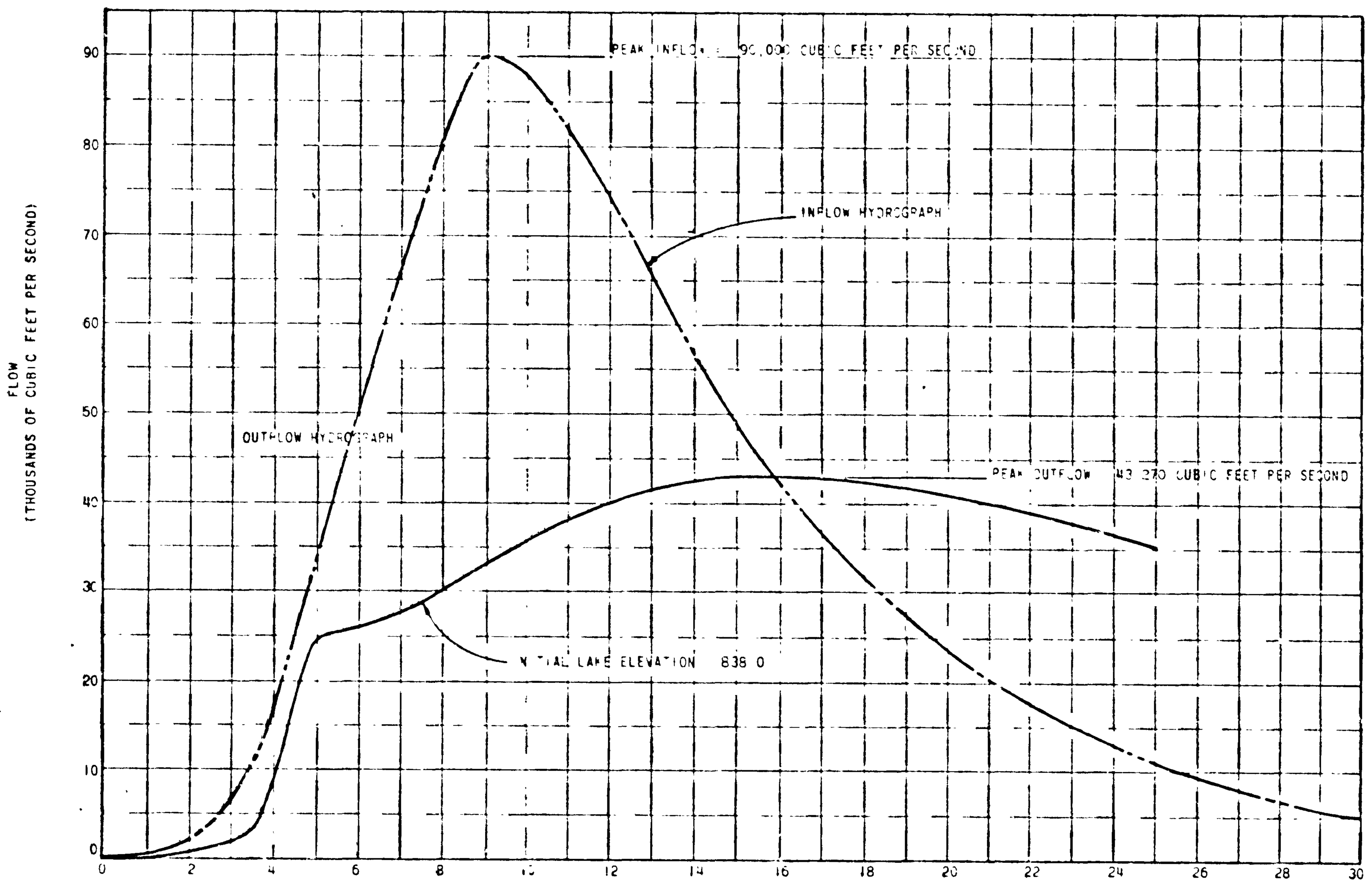
TITLE: AQC POND AND LA CYGNE LAKE DAM LOCATION

DRAWN BY	CHECKED BY	APPROVED BY
TMS	WDS	BDL
PROJECT NO.	DATE	FIGURE NO.
16530629	SEPT. 2010	E-1

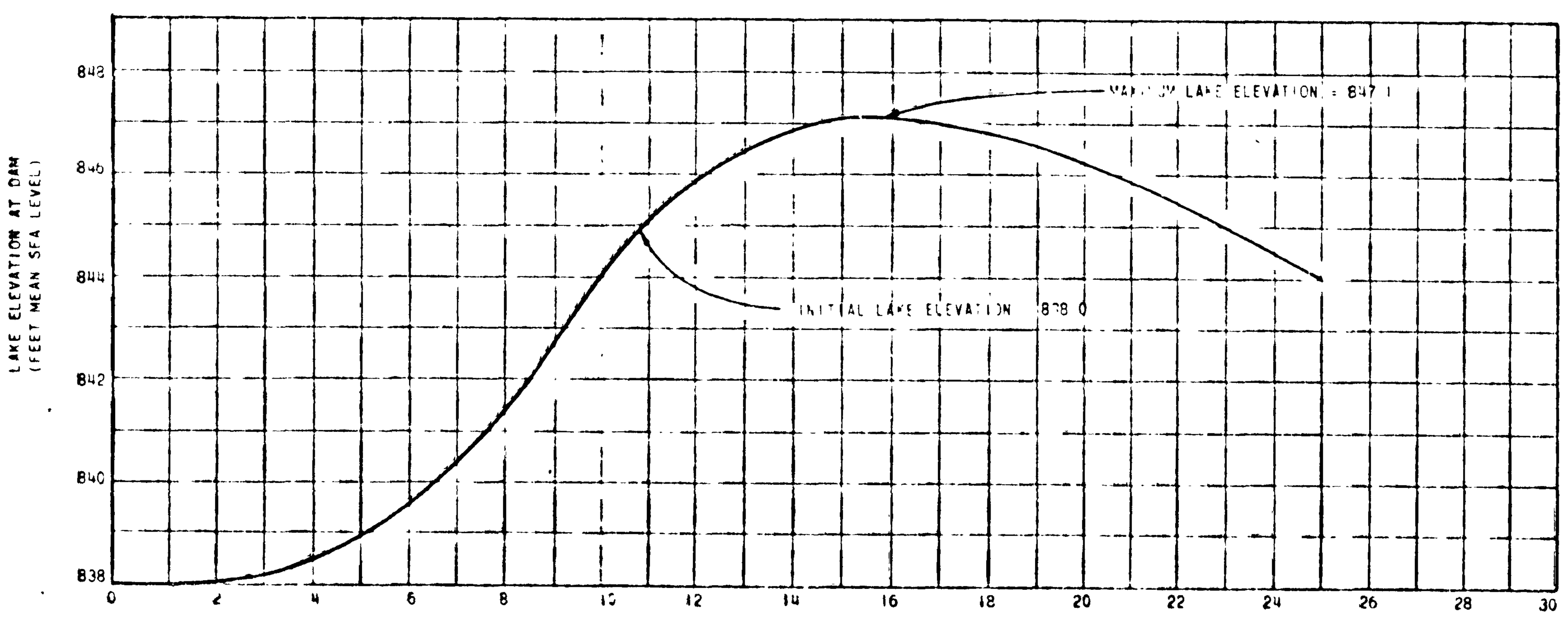
September 20, 2010 9:23:36 am (mlk)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Geotech Report – Appendix.dwg



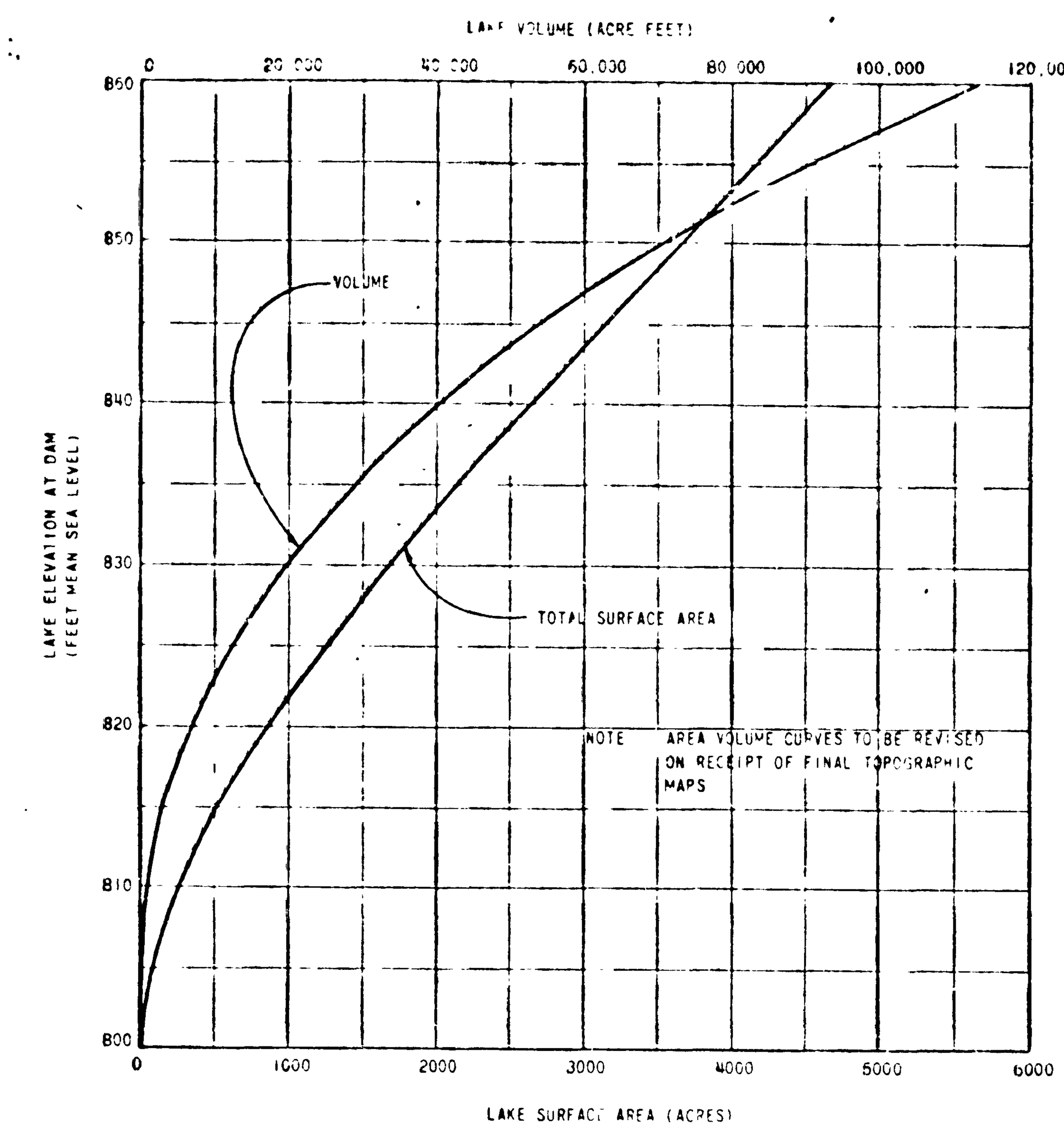
RAINFALL DISTRIBUTION AND LOSSES
SPILLWAY DESIGN STORM



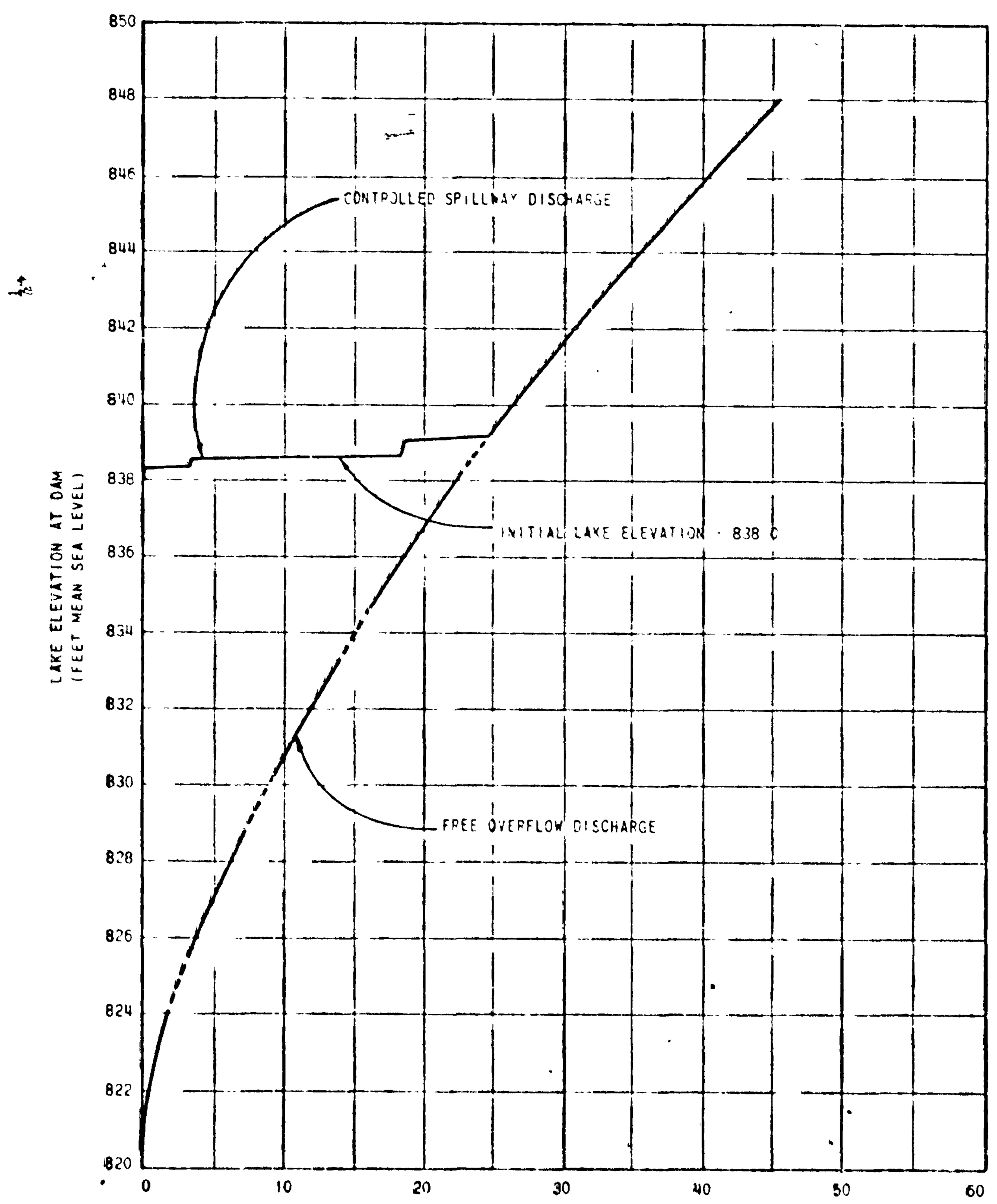
INFLOW AND OUTFLOW HYDROGRAPHS
SPILLWAY DESIGN FLOOD



LAKE ELEVATION AT DAM DURING
SPILLWAY DESIGN FLOOD



LAKE AREA-VOLUME CURVES



SPILLWAY CAPACITY CURVES
CONTROLLED DISCHARGE AND FREE OVERFLOW

PERTINENT DATA
LACYGNE LAKE

GENERAL:

PROJECT LOCATION: 55 MILES SOUTH OF KANSAS CITY IN MIAMI COUNTY AND LINN COUNTY, KANSAS

DAM LOCATION: SIX MILES EAST OF LA CYGNE, KANSAS, ON NORTH SUGAR CREEK (SECTIONS 4 AND 5, T20S, R25E) 10.5 STREAM MILES NORTHEAST OF THE CONFLUENCE WITH THE MARAIS DES CYGNES RIVER

DRAINAGE AREA: 57.5 SQUARE MILES

DAM

TYPE ZONED EARTHFILL WITH CLAY CORE LENGTH (FT)	6970
MAXIMUM HEIGHT ABOVE STREAMBED (FT)	60
TOP WIDTH (FT)	36
TOP ELEVATION WITHOUT CAMBER ALLOWANCE (FT, MSL)	854
FREEBOARD (FT)	7
SLOPES	
UPSTREAM	2:1 AND 3:1
DOWNSTREAM	3:1

LAKE

MINIMUM OPERATING LAKE LEVEL = 831.0 FT., MSL	
SURFACE AREA (ACRES)	1,750
VOLUME (ACRE-FT.)	21,000
NORMAL OPERATING LAKE LEVEL = 838.0 TO 840.0 FT, MSL	
LAKE LEVEL = 838.0 FT, MSL	
SURFACE AREA (ACRES)	2,420
VOLUME (ACRE-FT.)	36,000
LAKE LEVEL = 840.0 FT, MSL	
SURFACE AREA (ACRES)	2,600
VOLUME (ACRE-FT.)	40,000
MAXIMUM OPERATING LAKE LEVEL AT DAM = 847 FT, MSL	
SURFACE AREA (ACRES)	3,350
VOLUME (ACRE-FT.)	60,000
SEDIMENT RESERVE (ACRE FT.)	500

SPILLWAY

TYPE RADIAL GATE CONTROLLED CONCRETE OGEE WITH HYDRAULIC JUMP STILLING BASIN	
DESIGN FLOOD	
PEAK INFLOW (CFS)	90,000
VOLUME (ACRE FT.)	92,000
TOTAL RAINFALL (INCHES PER 24 HOURS)	28.72
GROSS CREST LENGTH (FT)	95
NET CREST LENGTH (FT)	88
CREST ELEVATION (FT, MSL)	820.5
DISCHARGE CAPACITY AT MAXIMUM LAKE LEVEL (CFS)	43,270
RADIAL GATES	
NUMBER	2
SIZE (WIDTH x HEIGHT) (FT)	44x23
TOP ELEVATION OF GATE (FT, MSL)	842.0
WITH 9'-5" CUTOUT AT EL. 840.0 FT, MSL (ONE GATE ONLY)	

GENERAL NOTES

DWG. NO. | REFERENCE DRAWINGS

THIS IS A REPRODUCED DRAWING
(ONE-HALF ORIGINAL SIZE)

3-14-69	ISSUED FOR BIDS
2-20-69	ISSUED FOR APPROVAL OF KINTS
DATE	REVISIONS AND RECORD OF ISSUE

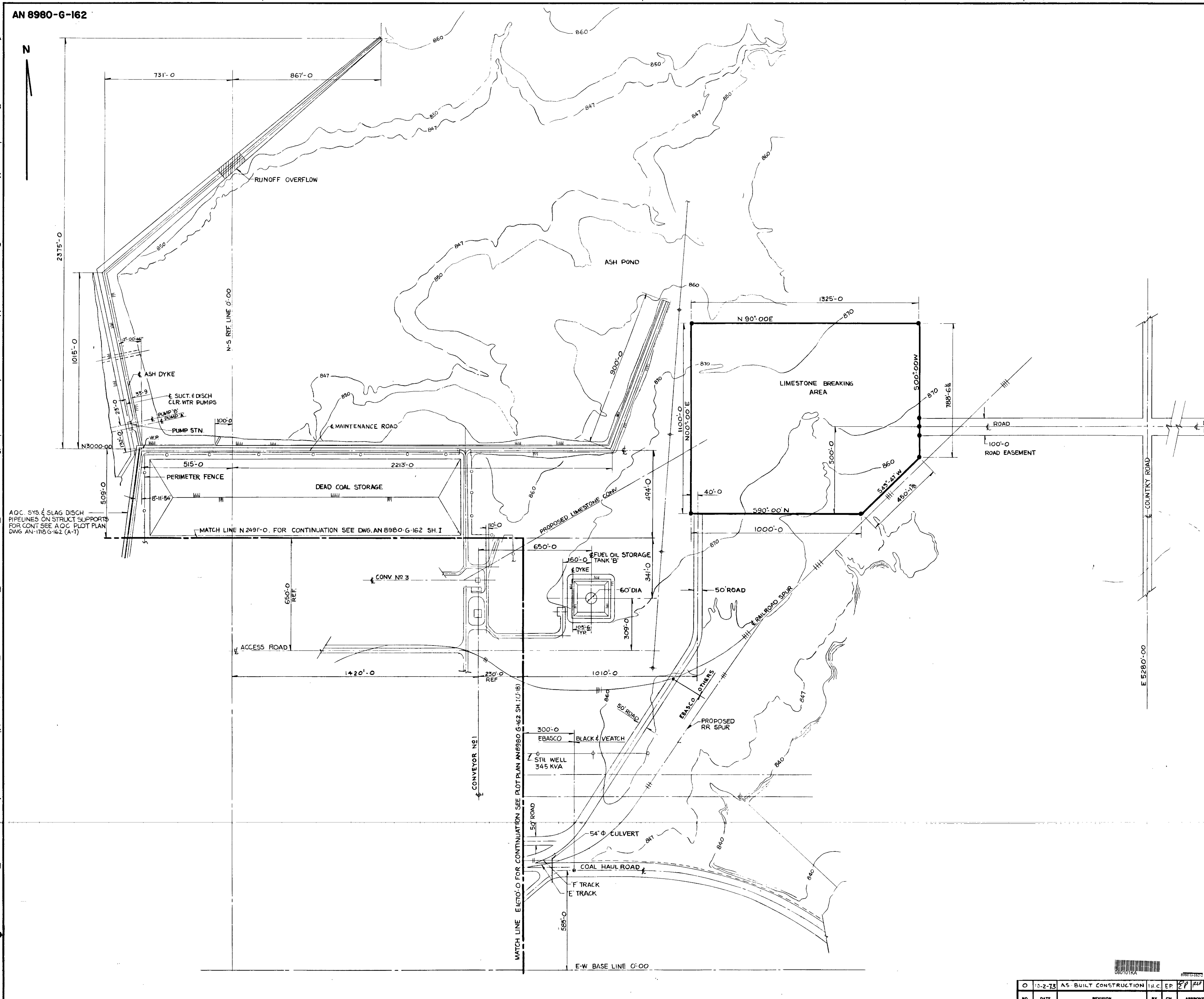
KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE LAKE

DAM
HYDROLOGIC DATA

APPROVED FOR CONSTRUCTION	DEPT HEAD	DESIGNER	CHECKED	DRAWN	PROJ NO.
BY ____ DATE ____	CLM	DJW		SMS	4993

BLACK & VEATCH
CONSULTING ENGINEERS — KANSAS CITY, MISSOURI

DRAWING NO. D-202



KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS & ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
1973 - 848 MW (NET) INSTALLATION - UNIT NO. 1

PLOT PLAN (SH. 2)

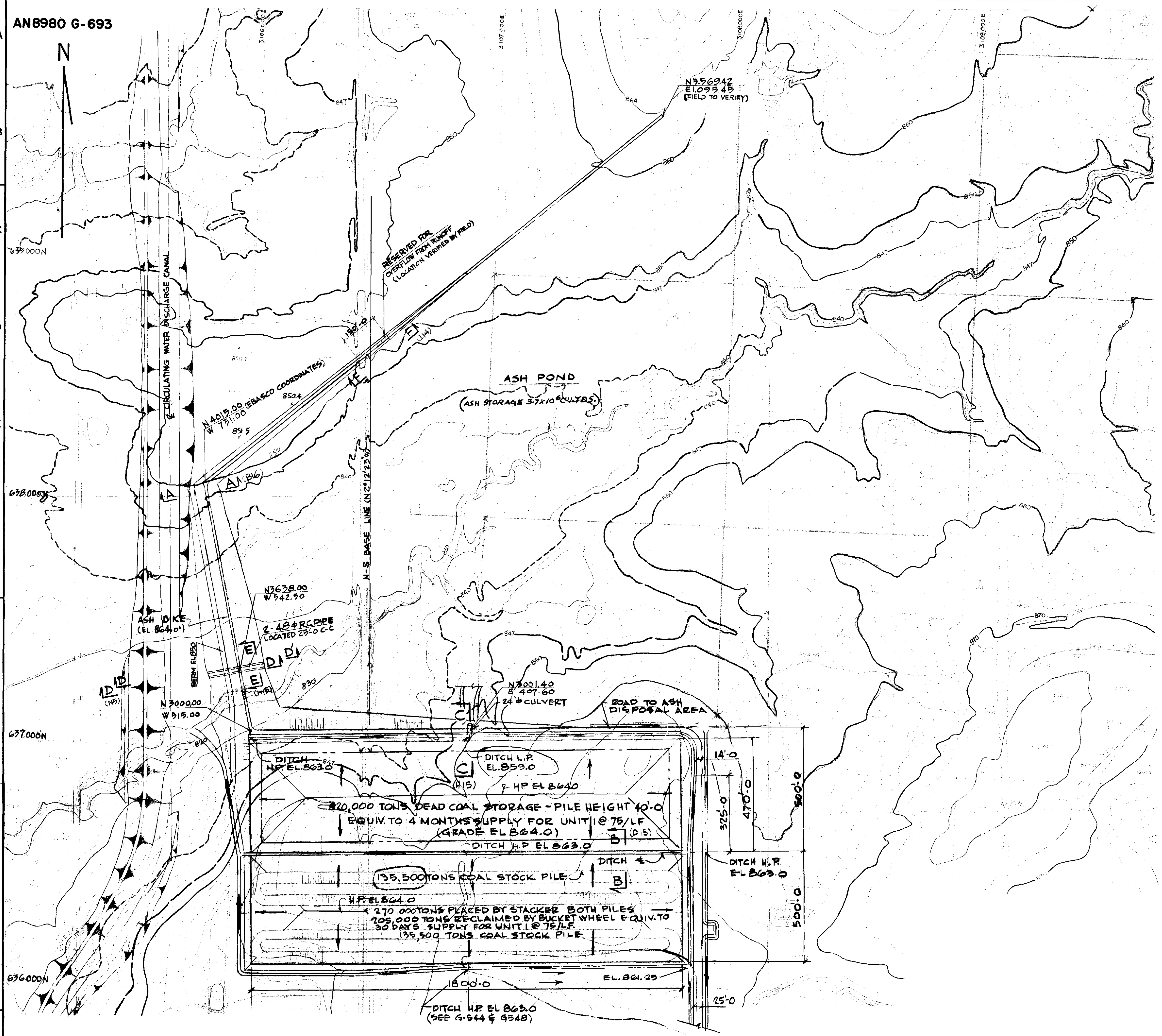
EBASCO SERVICES INCORPORATED NEW YORK

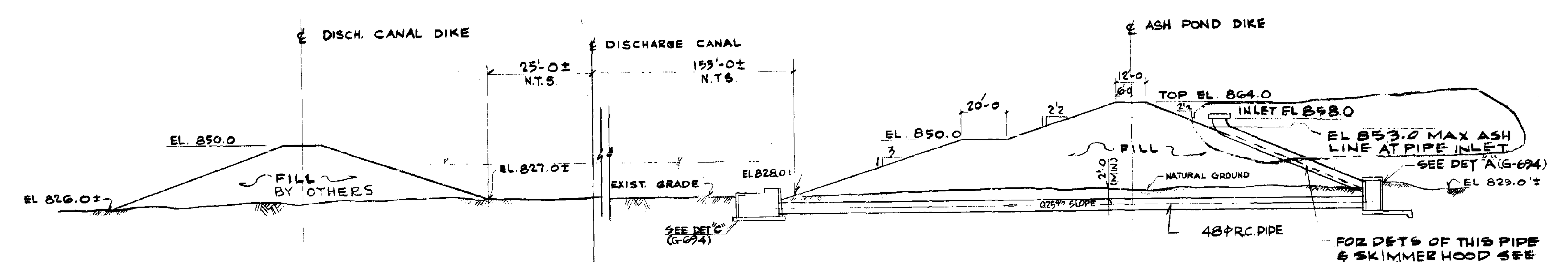
SCALE 1" = 200' | APPROVED | DATE 10-2-73
DIV. MECH
DR. I.H. CHEN
CH. E.P.

AN8980 G-162

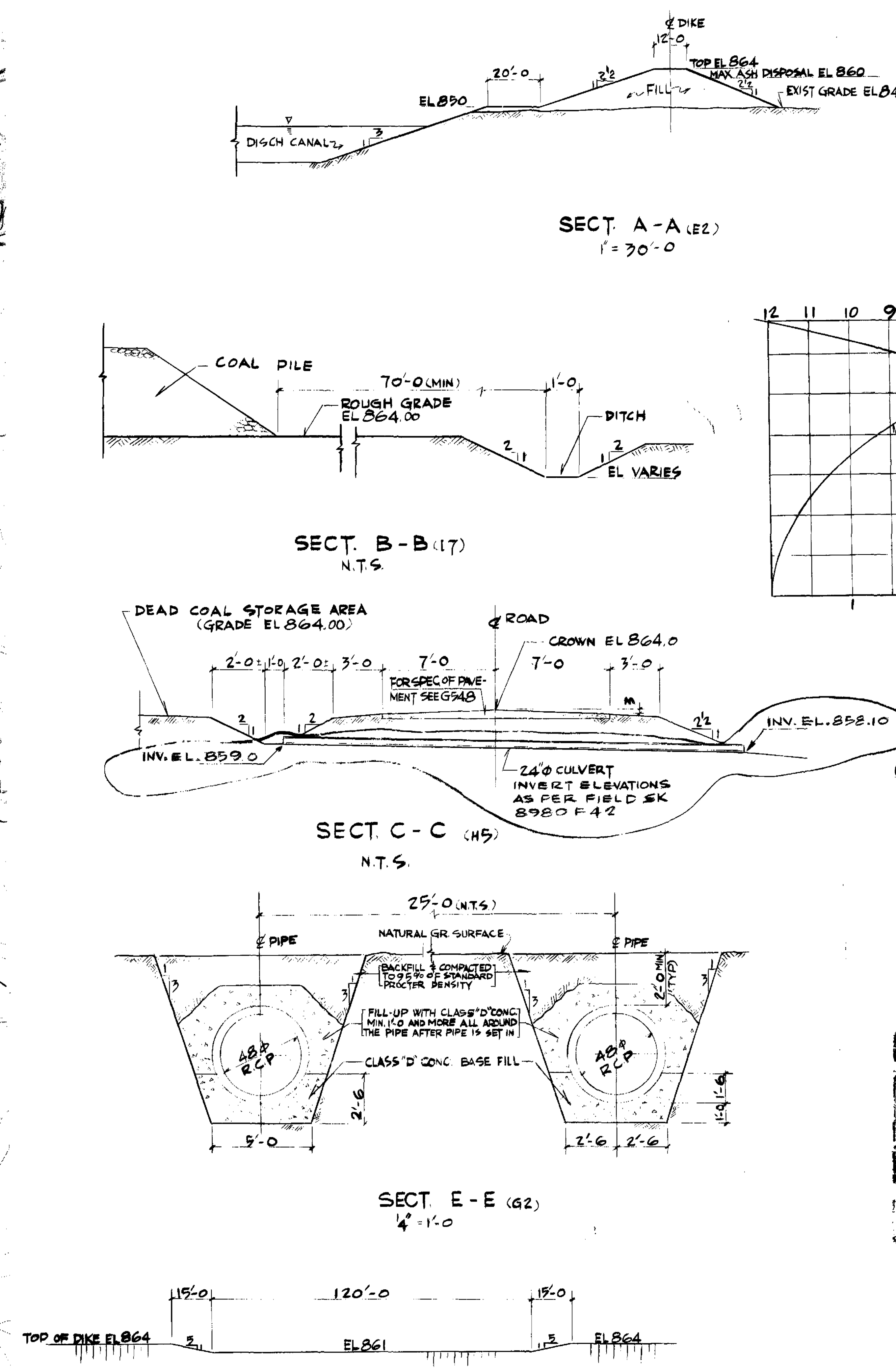
NO.	DATE	REVISION	BY	CH.	APPROVED
0	10-2-73	AS-BUILT CONSTRUCTION	I.H.C.	EP.	EP

AN8980 G-693





SECT D-D (G1) & SECT D'-D' (G1)
1" = 30'-0



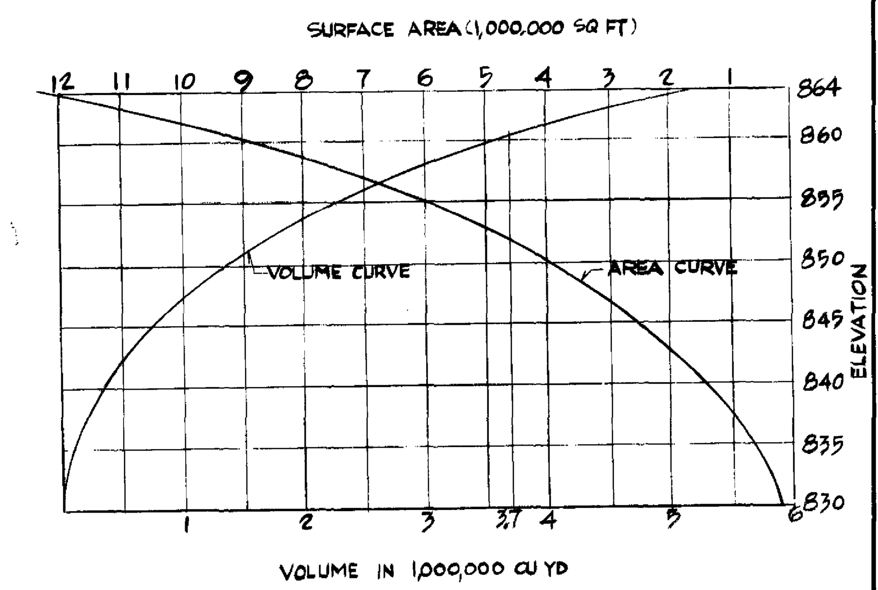
SECT A-A (E2)
1" = 30'-0

SECT B-B (17)
N.T.S.

SECT C-C (H5)
N.T.S.

SECT E-E (G2)
1/4" = 1'-0

ELEVATION F-F (D4)
1" = 30'-0



APPROX STORAGE
(VOLUME OF DIKE FILL NOT INCLUDED)

QUANTITIES (NET, BY FIELD UNLESS NOTED)

AREA	EXCAVATION	FILL
ASH DISPOSAL AREA DIKE		115,100 CU. YDS

FILL QTY'S EXCLUDE FILLING OF REMOVED UNSUITABLE MATERIAL UNDERNEATH DIKE AND 10% SHRINKAGE.

MAX. ASH STORAGE VOLUME 3.7×10^6 CU YDS
24"φ CULVERT — 30 LIN FT
48"φ R.C. PIPE — 470 LIN FT (VERIFIED BY FIELD)
PAVING MATERIALS (ASPHALT & CRUSHED STONE) BY FIELD

NOTES

FILL MATERIAL IN THIS DIKE SHALL BE COMPACTED TO 95% OF STANDARD PROCTER DENSITY. THE MOISTURE CONTENT OF THE BACKFILL SHALL BE WITHIN THE LIMITS OF THE OPTIMUM MOISTURE REQUIRED TO OBTAIN THE PERCENT COMPACTION REQUIRED. ADDITIONAL REQUIREMENTS FOR THE FILL ARE NOTED IN PARAGRAPH D9 OF THE GRADING AND DRAINAGE SPECIFICATIONS FOR CONTRACT LA C1. DENSITY TESTS OF THE COMPACTED FILL SHALL BE PERFORMED FOR EVERY 30,000 SQUARE FEET PER 6 INCH LIFT WITH A MINIMUM OF ONE TEST PER DAY FOR THE DIKE SECTION ADJACENT TO THE DISCHARGE CANAL. THE FILL MATERIAL FOR THE NORTH DIKE SECTION FROM CENTERLINE COORDINATES EAST 3,105,832 AND NORTH 638,100 TO THE EAST WILL BE TESTED ONCE FOR EVERY 100,000 SQUARE FEET PER LIFT WITH A MINIMUM OF ONE TEST PER DAY.

THE VOLUME OF STORAGE 3.7 MILLION CUBIC YARDS COVERS A DISPOSAL AREA OF APPROXIMATELY 160 ACRES AND PROVIDES 3 YEARS OF ASH STORAGE FOR UNIT NO. 1 AT MAXIMUM GUARANTEED LOAD AND BURNING A COAL HAVING A 24% ASH CONTENT.

THE QUANTITY OF WATER TO BE DISCHARGED TO ASH POND WILL BE FROM THE FOLLOWING SOURCES:

1. 10,000 gpm FROM THE ASH SLUICE PUMPS.
2. 15,000 gpm (MAXIMUM) FROM THE SO_2 SYSTEM PUMPS.
3. RAINFALL RUN-OFF FROM THE DRAINAGE AREA CONFINED WITHIN THE LIMITS OF THE ASH POND.*

* RUN-OFF VALUES OBTAINED FROM THE DATA PREPARED BY OTHERS.

THE 48"φ R.C. PIPES USED FOR DRAINING ABOVE QUANTITIES OF WATER UNDER THE EMBANKMENT SHALL BE IN ACCORDANCE WITH SPECIFICATION ASTM C76-64T AND SHALL BE CLASS III PIPE WITH A CLASS "A" BEDDING.

FOR DETAILS AND REINF. STEEL OF THE INLET AND OUTLET STRUCTURES OF THE DRAINAGE PIPE LINES SEE DWG AN8980 G694, AND BAR BENDING SCHEDULE B541-16.

REFERENCE DRAWINGS

LIST OF DRAWINGS — AN8980-A-160
PLAN AREA GRADING AND DRAINAGE PLAN — AN8980-G-545
ASH POND DIKE DETS M & R — AN8980-G-694
PLANT SITE GRADING & DRAINAGE — AN8980-G-544
PLANT ROADS & RAILROAD SECT & PROFILE — AN8980-G-548
DRAINAGE COAL STORAGE AREA (FIELD SKETCH) — AN8980 F-42

08012IKQ
8980 G-693

NO.	DATE	REVISION	BY	CH.	APPROVED
2	3-22-71	ADDED (K16) DITCH; (M18) REF. DWG REV. (M9) EL. OF PIPE & SKIMMER. (I9) EL. (F15) INVERT EL'S. (J4)	ST	W.H.	O.K.
1		ADDED (M10) NOTE & EL.	AL	DP	O.K.

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
1973-848 MW (NET) INSTALLATION - UNIT NO. 1

ASH POND DIKE PLAN & SECT

EBASCO SERVICES INCORPORATED NEW YORK

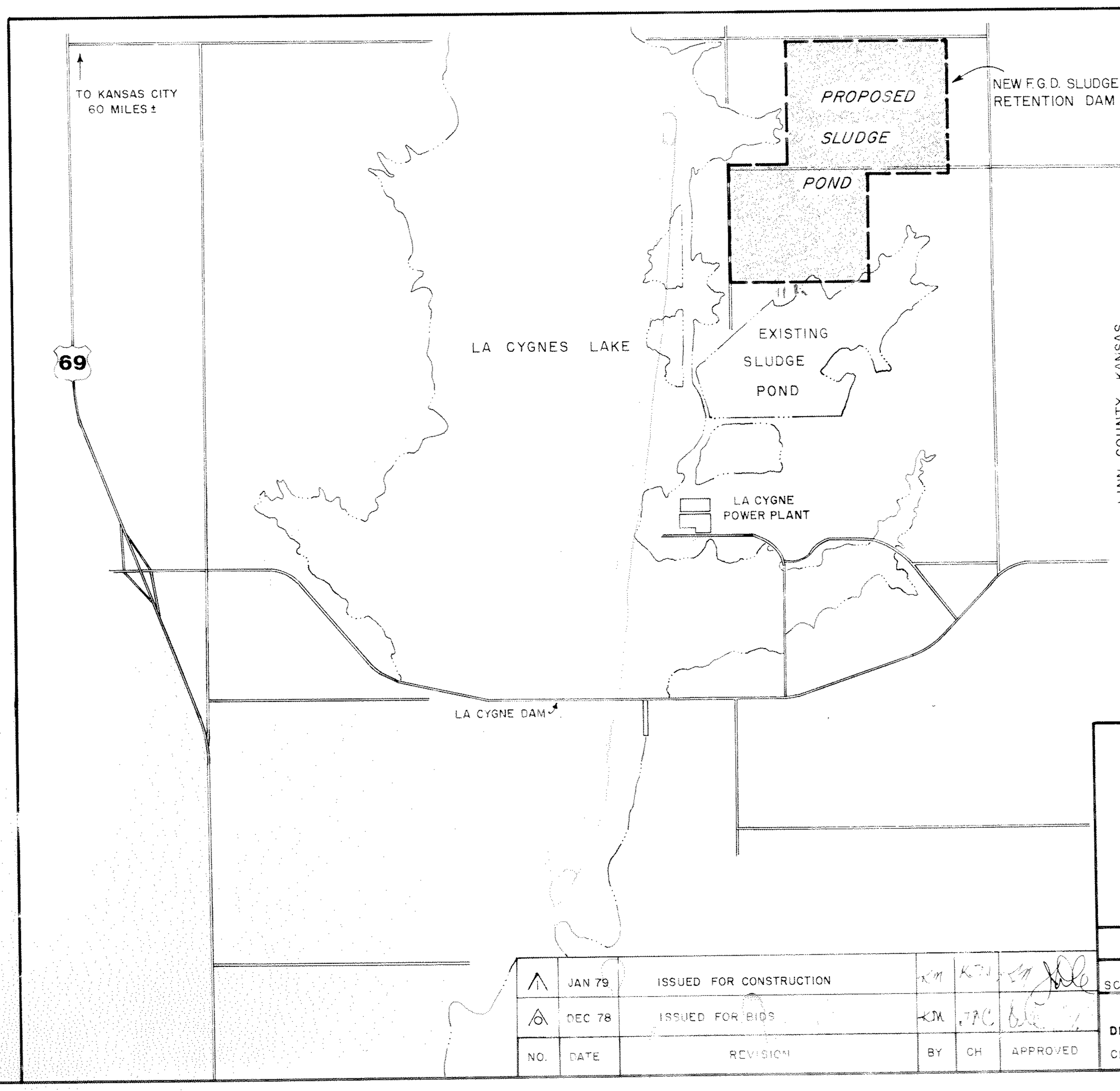
SCALE
APPROVED G. A. Feltato
DATE
DIV. C-H
DR.
CH.

AN8980
G-693

LA CYGNE STATION - F.G.D. SLUDGE RETENTION DAM - STAGE 1

CONSTRUCTION OF DAM TO ELEVATION 890 FEET AND APPURTENANT STRUCTURES

LIST OF CONTRACT DRAWINGS



APPROVED
This 30TH day of JANUARY 79
Guy E. Gibson
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

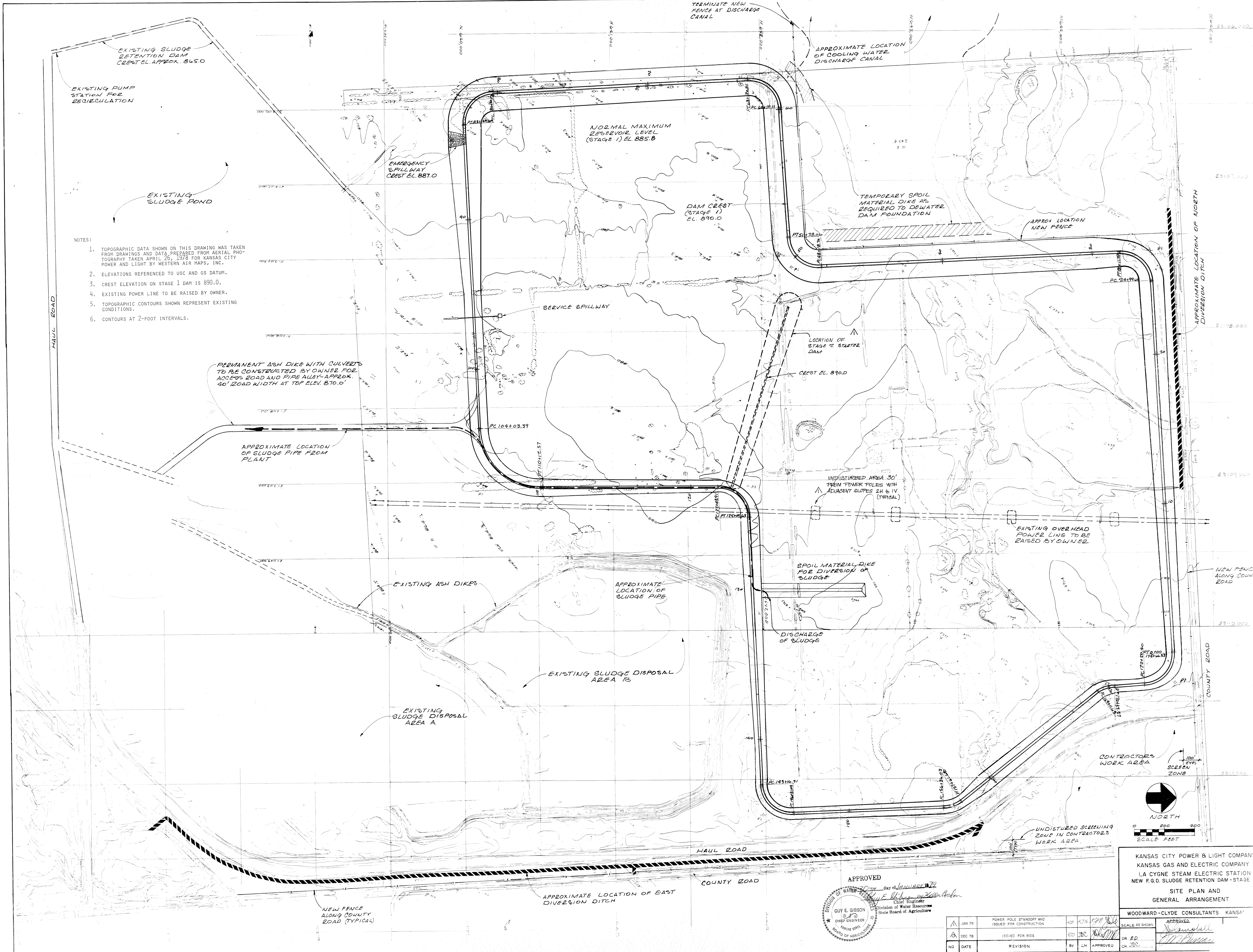
KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

SITE LOCATION PLAN

WOODWARD-CLYDE CONSULTANTS

SCALE: AS SHOWN
APPROVED
DR. KM
CH. JJC

NO.	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION	KM	KJJ	
0	DEC 78	ISSUED FOR BIDS	KM	JJC	



NOTES:

1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
3. CREST ELEVATION ON STAGE 1 DAM IS 890.0.
4. EXISTING POWER LINE TO BE RAISED BY OWNER.
5. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
6. CONTOURS AT 2-FOOT INTERVALS.

APPROVED
20TH day of JANUARY 1979
Guy E. Gibson by Keller Cordon
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE
BOARD OF AGRICULTURE

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	POWER POLE STANDOFF AND ISSUED FOR CONSTRUCTION	KM	KJN	KM JDC
0	DEC 78	ISSUED FOR BIDS	ED	JDC	JDC DMB

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

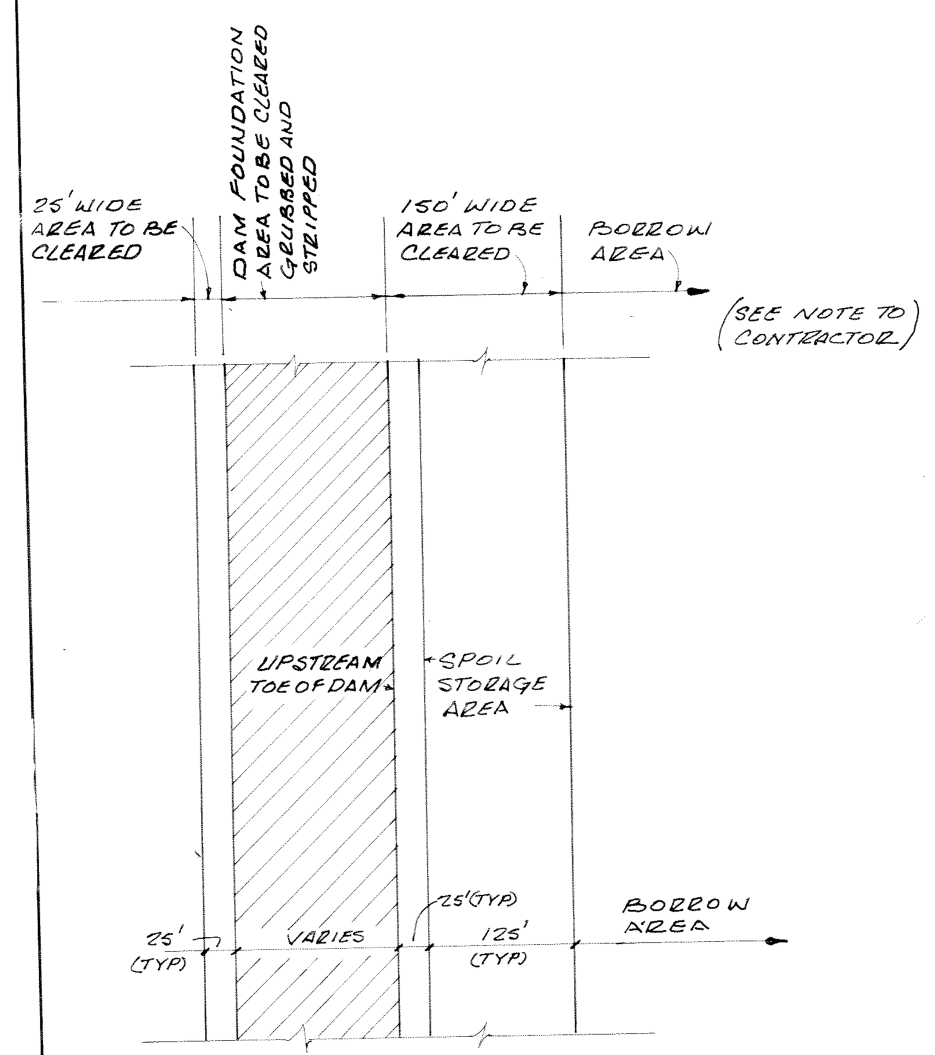
SITE PLAN AND
GENERAL ARRANGEMENT

WOODWARD-CLYDE CONSULTANTS KANSAS

SCALE AS SHOWN
DR. ED
CH. JDC
APPROVED
J Campbell
D M Bumen

NOTES:

1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
4. CONTOURS AT 2-FOOT INTERVALS.
5. ALL CLEARING, GRUBBING AND STRIPPING SHALL CONFORM TO THE TECHNICAL SPECIFICATIONS.

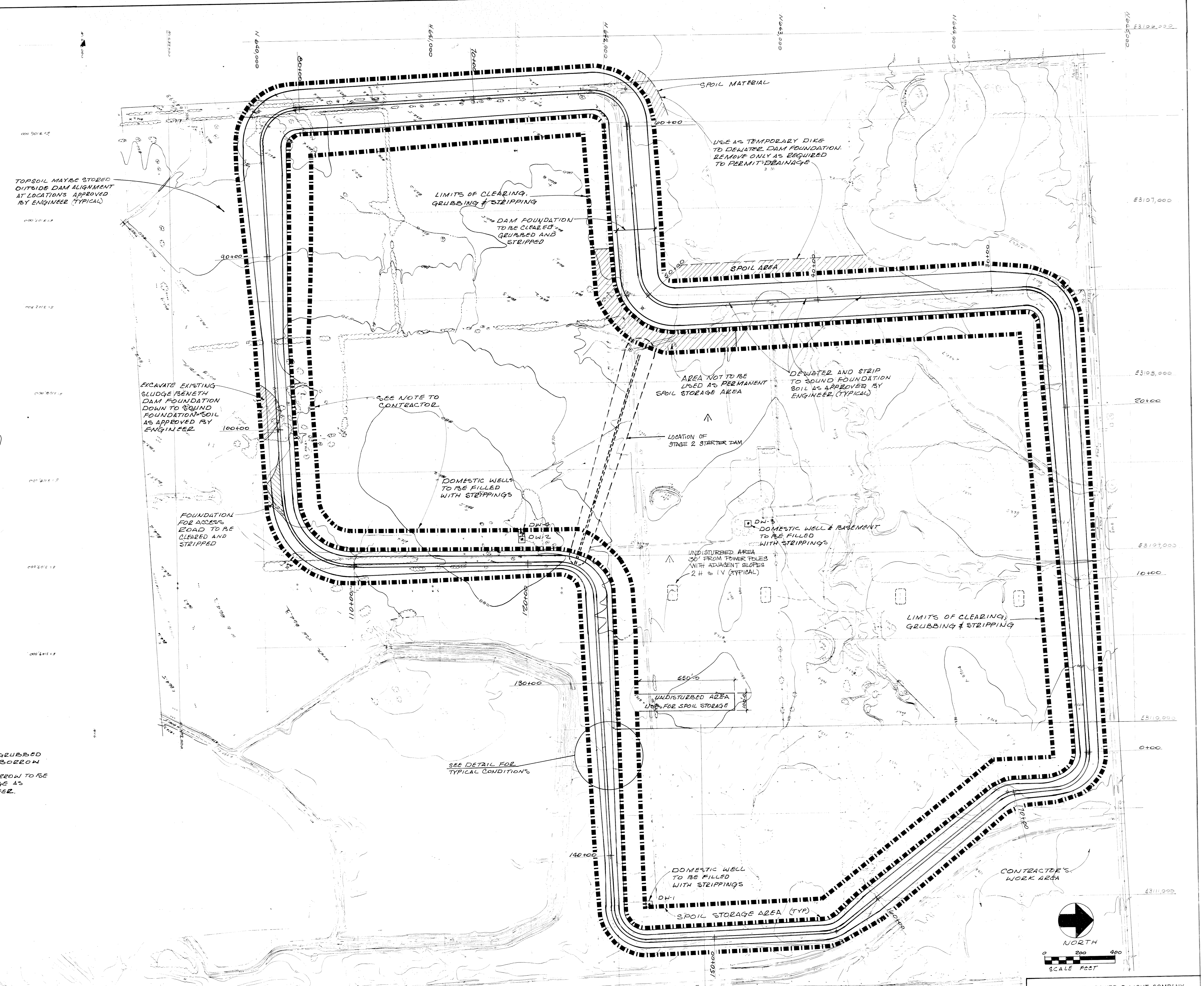


DETAIL

SCALE FEET

NOTE: TO CONTRACTOR

AREA TO BE CLEARED, GRUBBED AND STRIPPED WHERE BORROW IS OBTAINED.
AREAS NOT USED FOR BORROW TO BE USED FOR SPOIL STORAGE AS APPROVED BY ENGINEER.



APPROVED
30TH day of JANUARY 1979
Guy E. Gibson by Keller Corden
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES · GUY E. GIBSON · CHIEF ENGINEER · KANSAS STATE BOARD OF AGRICULTURE

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

LIMITS OF CLEARING, GRUBBING, STRIPPING AND SPOIL AREAS

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	POWER POLE STANDOFF AND ISSUED FOR CONSTRUCTION	KM	KJN	[signature]
0	DEC 78	ISSUED FOR BIDS	ED	JDC	[signature]

SCALE AS SHOWN | APPROVED | DATE DEC 1978
DR. ED | CH. JDC
KC 205.80
SHEET 3

NOTES:

1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
4. CONTOURS AT 2-FOOT INTERVALS.
5. ALL LOCATIONS OF BORINGS, TEST PITS, OBSERVATION WELLS, DOMESTIC WELLS, CORPS OF ENGINEERS BORING AND PITTSBURGH & MIDWAY COAL COMPANY BORING WERE MEASURED FROM CENTERLINE OF DAM.
6. ALL EXCAVATION PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.

LEGEND:

B-1	LOCATION AND NUMBER OF BORING
TP-1	LOCATION AND NUMBER OF TEST PIT
OW-1	LOCATION AND NUMBER OF OBSERVATION WELL
DW-1	LOCATION AND NUMBER OF DOMESTIC WELL TO BE FILLED
WES B-6	LOCATION AND NUMBER OF CORPS OF ENGINEERS BORING
PMB-32M	LOCATION AND NUMBER OF PITTSBURGH & MIDWAY COAL COMPANY BORING

APPROVED

30TH day of JANUARY 1979

Guy E. Gibson By Keller Cordon

Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE
BOARD OF AGRICULTURE

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION	KN	KJN	
0	DEC 78	ISSUED FOR BIDS	ED	JDC	

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

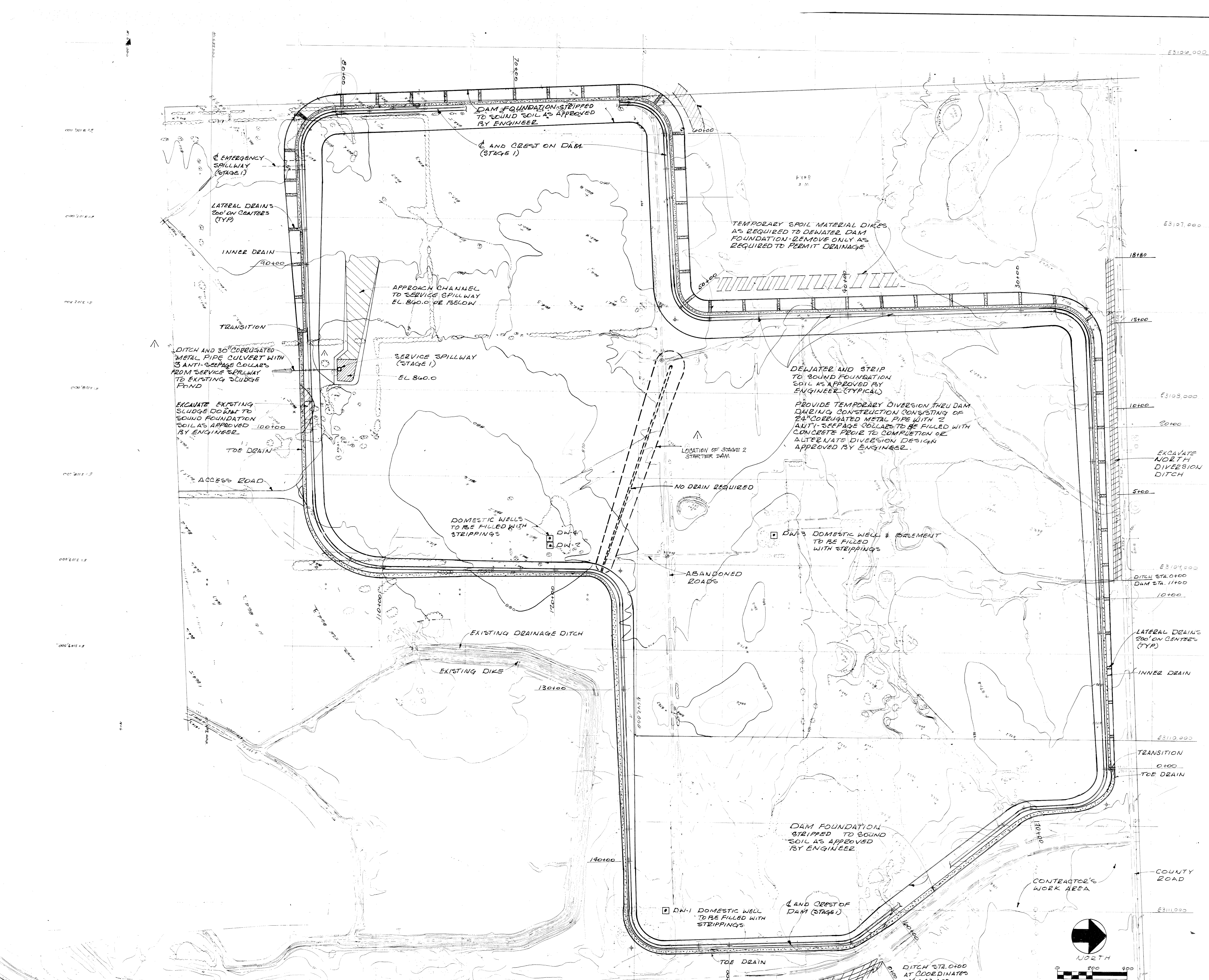
BORROW AREA AND
BORING LOCATION PLAN

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

SCALE: AS SHOWN
DR. ED
CH. JDC
APPROVED
DATE DEC 1978
KC 205.80
SHEET 4

NOTES:

1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
4. CONTOURS AT 2-FOOT INTERVALS.
5. ALL EXCAVATION PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.



APPROVED
this 30TH day of JANUARY 1979
Guy E. Gibson by Keller Lordon
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

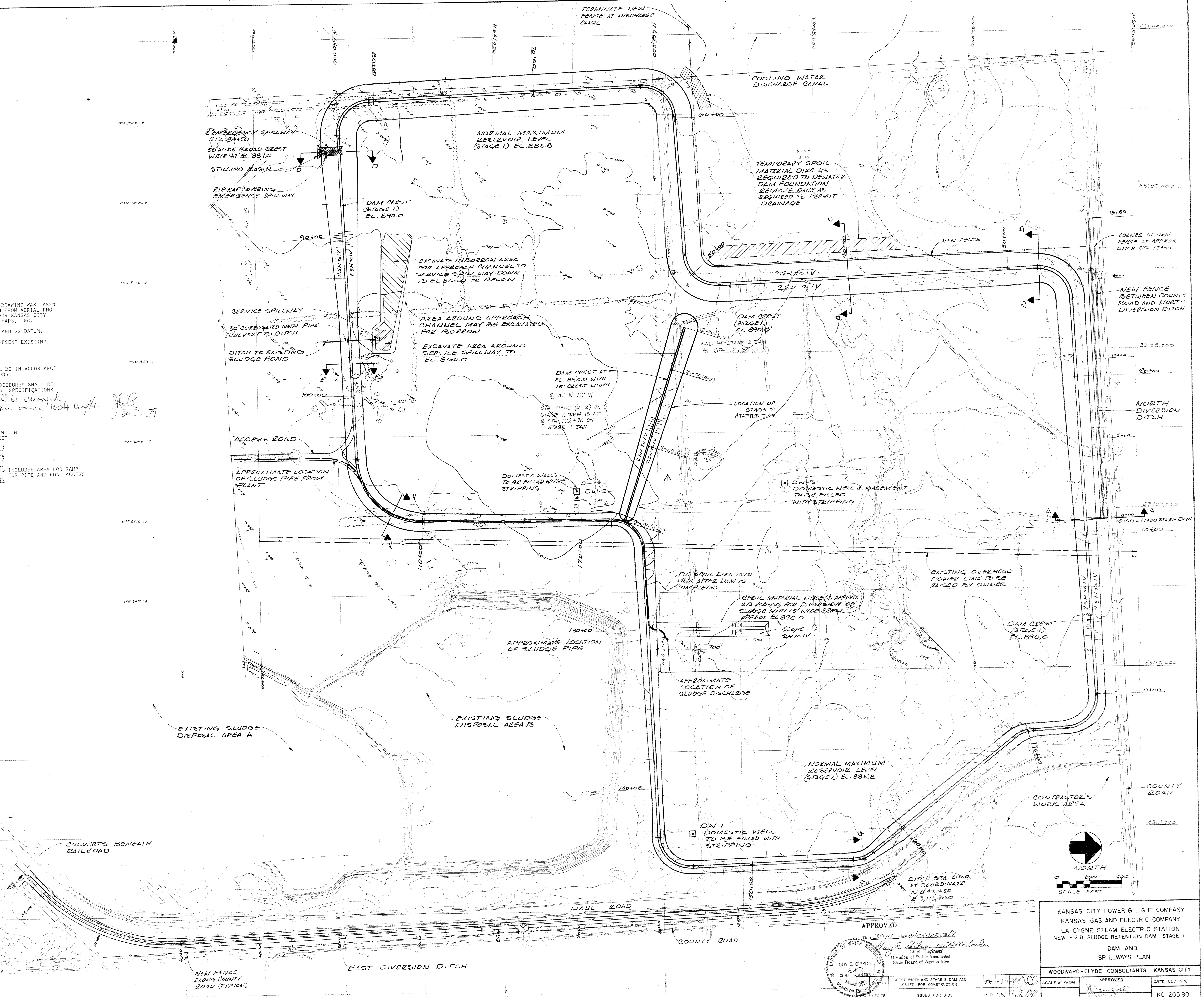
NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ADD ANTI-SEEPAGE COLLAR AND ISSUED FOR CONSTRUCTION	KM	KTN	
0	DEC 78	ISSUED FOR BIDS	ED	JDC	

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

DAM FOUNDATION GRADE AND EXCAVATION PLAN

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

SCALE AS SHOWN | APPROVED | DATE DEC 1978
DR. ED
CH. JDC
KC 205.80
SHEET 5



NOTES:

1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED FROM USC AND GS DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
4. CONTOURS AT 2-FOOT INTERVALS.
5. ALL EXCAVATION PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
6. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
7. Crest width of dam shall be changed by a gradual transition over a 100 ft length. [signature] 30 Jan 79

CREST WIDTH OF DAM

LOCATION ALONG DAM STATION		CREST WIDTH FEET	
0+00 - 24+00	/1\	13	
24+00 - 32+00		15	
32+00 - 93+00		18	
93+00 - 106+00		15	
106+00 - 114+00		15	INCLUDES AREA FOR RAMP FOR PIPE AND ROAD ACCESS
114+00 - 175+66		12	

APPROVED

This 30TH day of JANUARY 1979

Guy E. Gibson by Keller Cordon

Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

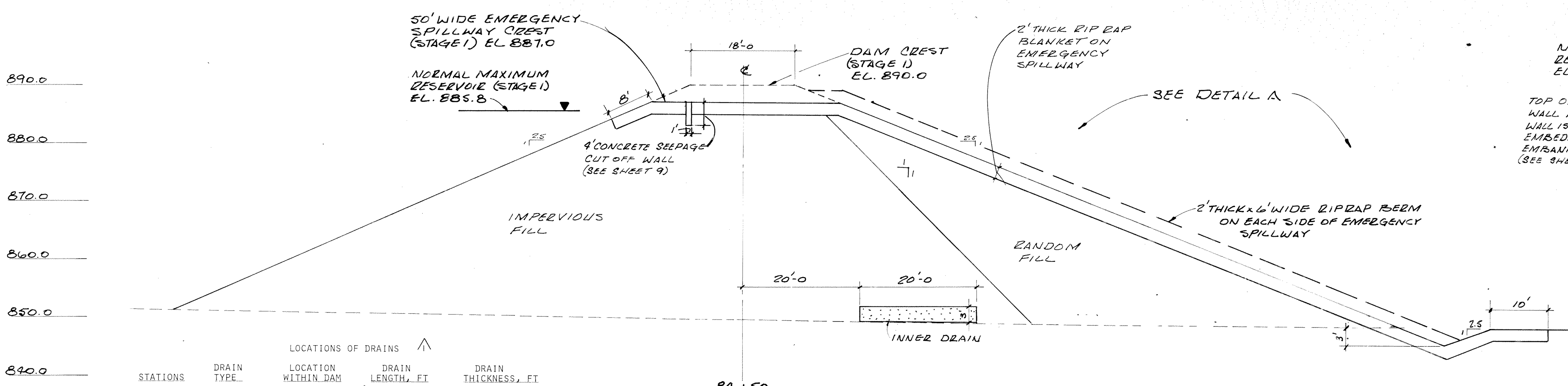
NO.	DATE	REVISION	BY	CH.	APPROVED
/1\	JAN 79	CREST WIDTH AND STAGE 2 DAM AND ISSUED FOR CONSTRUCTION	KM	KJN	[signatures]
/0\	DEC 78	ISSUED FOR BIDS	ED	JDC	[signatures]

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

DAM AND
SPILLWAYS PLAN

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

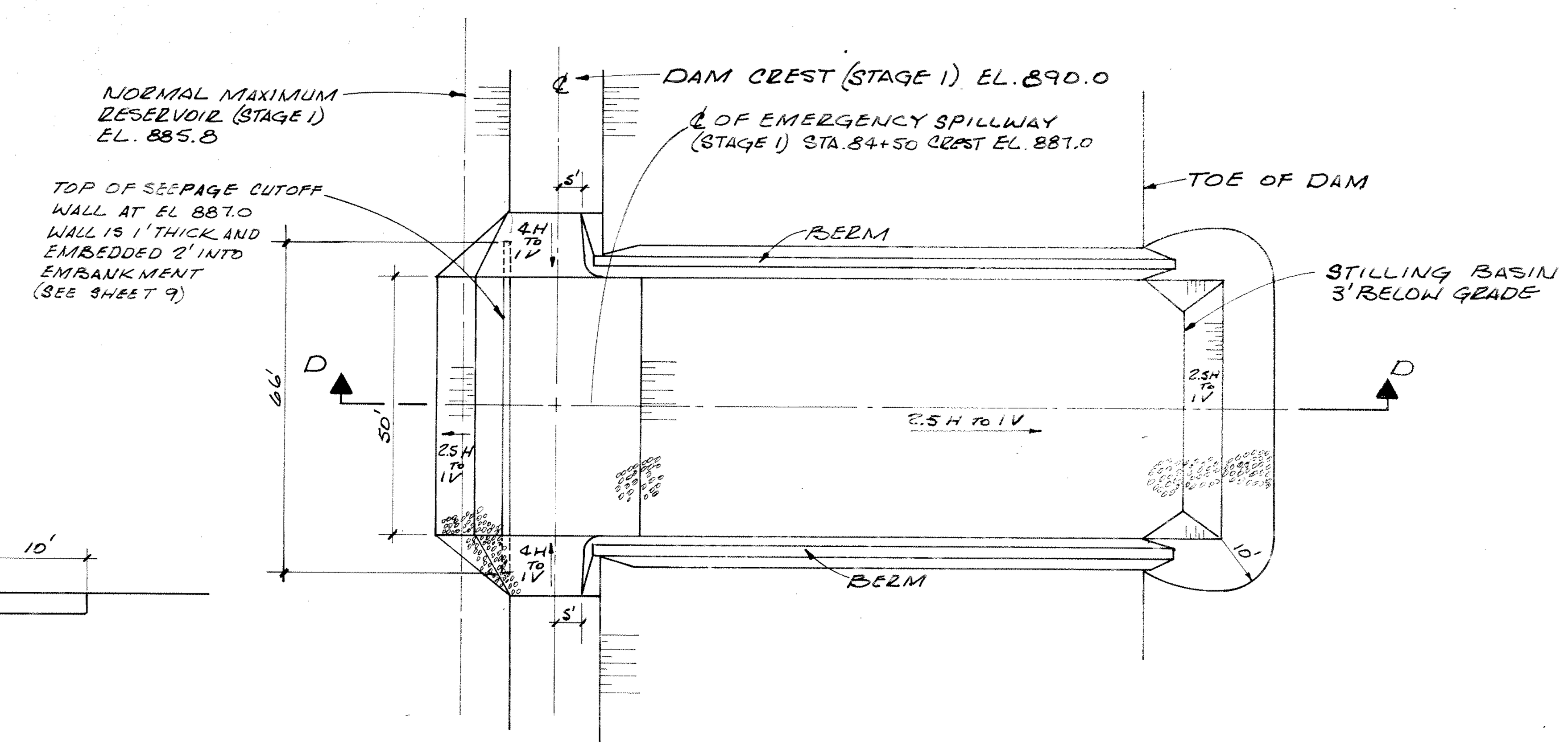
SCALE: AS SHOWN
DR. ED
CH. JDC
APPROVED [signatures]
DATE DEC 1978
KC 205.80
SHEET 6



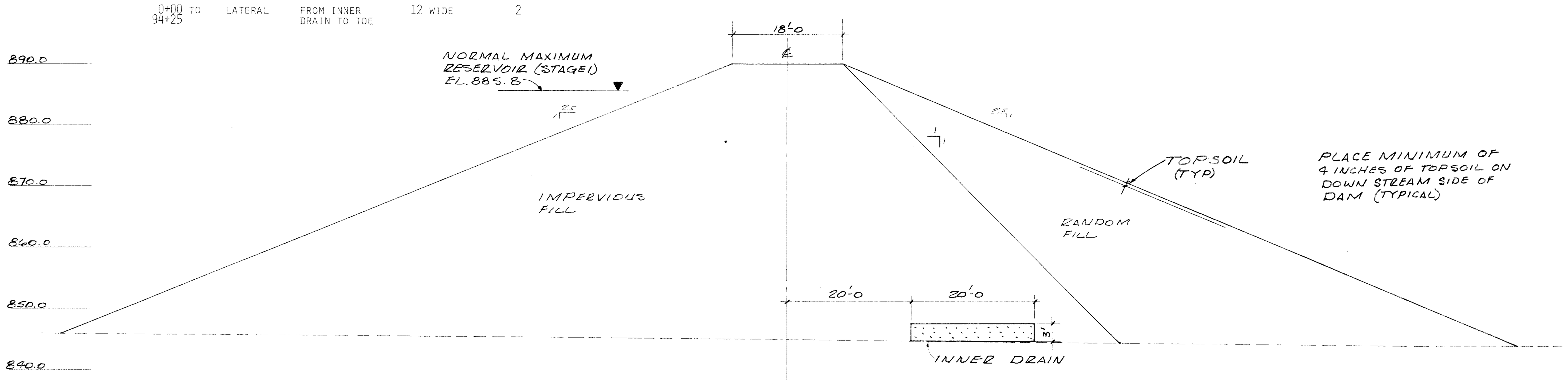
84+50
SECTION DD
℄ EMERGENCY SPILLWAY (STAGE 1)

LOCATIONS OF DRAINS ⚠1

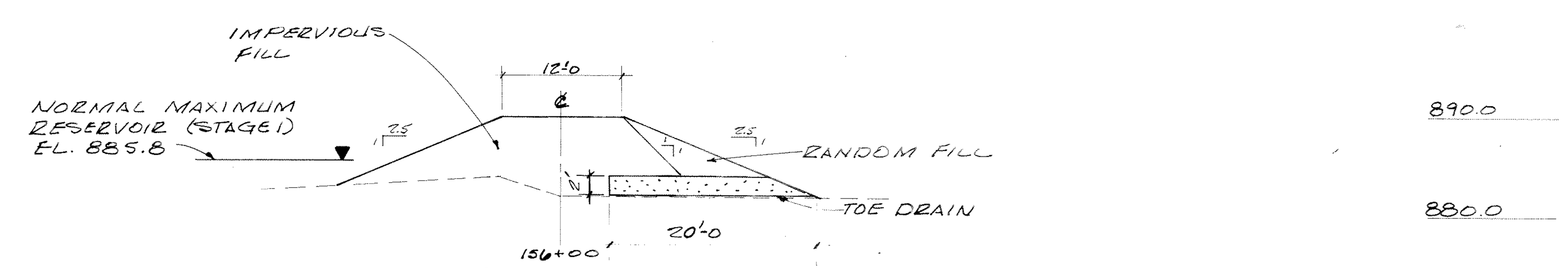
STATIONS	DRAIN TYPE	LOCATION WITHIN DAM	DRAIN LENGTH, FT	DRAIN THICKNESS, FT
0+00 TO 28+00	INNER	15 FT FROM CENTERLINE	15	3
28+00 TO 88+75	INNER	20 FT FROM CENTERLINE	20	3
88+75 TO 94+25	INNER	15 FT FROM CENTERLINE	15	3
94+25 TO 112+00	TOE	25 FT FROM TOE	25	2
112+00 TO 0+00	TOE	20 FT FROM TOE	20	2
0+00 TO 94+25	LATERAL	FROM INNER DRAIN TO TOE	12 WIDE	2



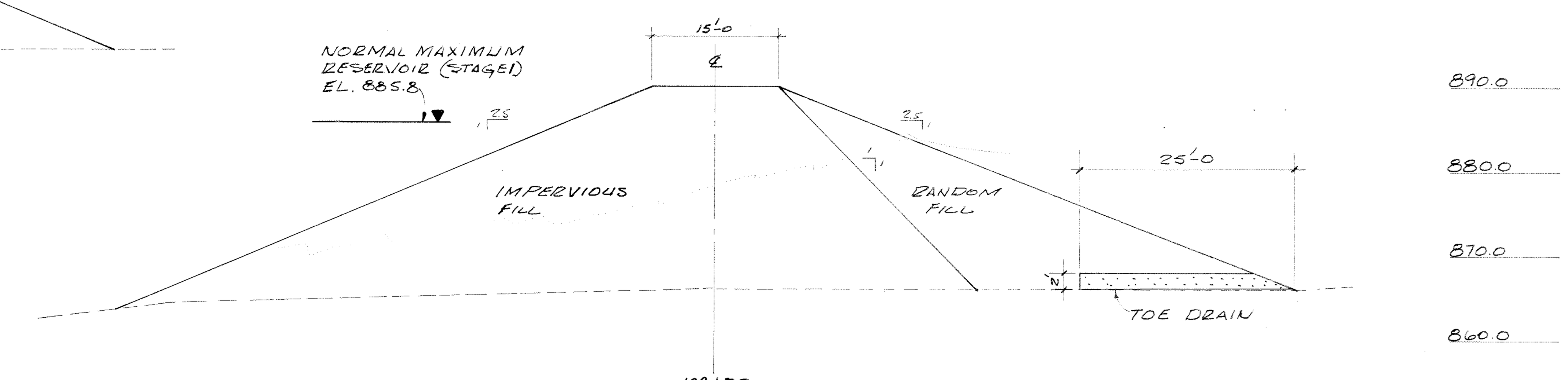
DETAIL A
EMERGENCY SPILLWAY PLAN
0 20 40
SCALE FEET



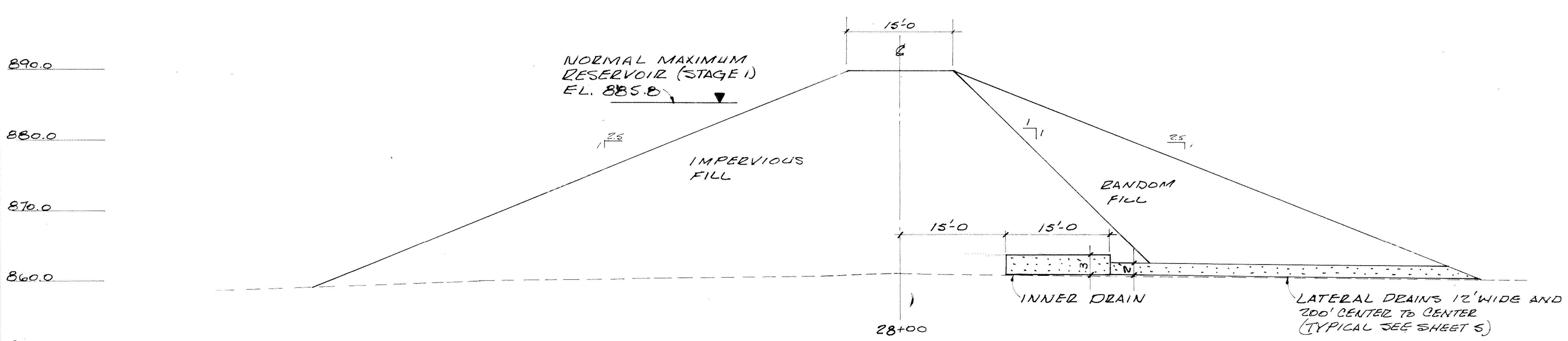
41+00
SECTION CC



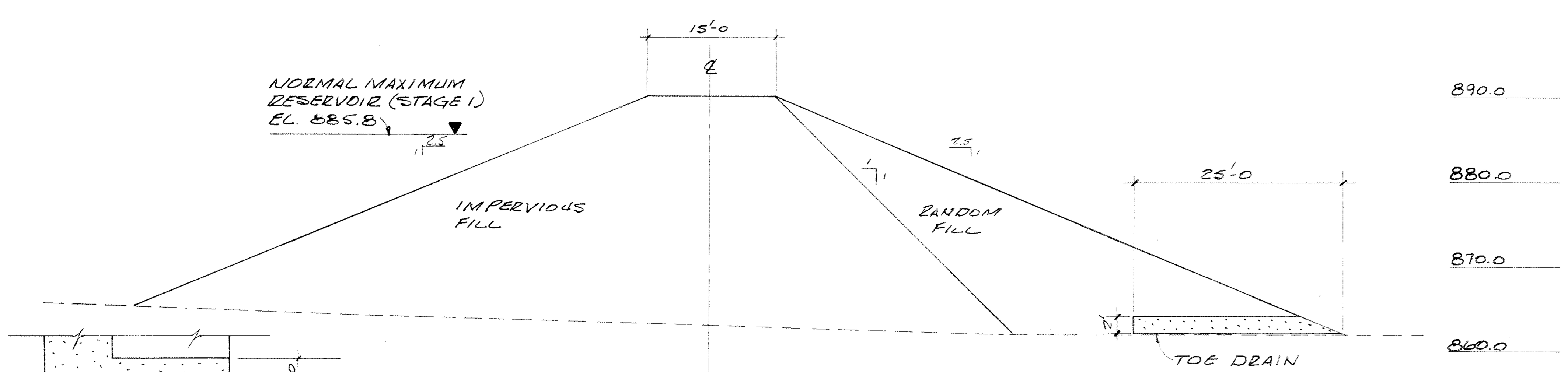
136+00
SECTION GG



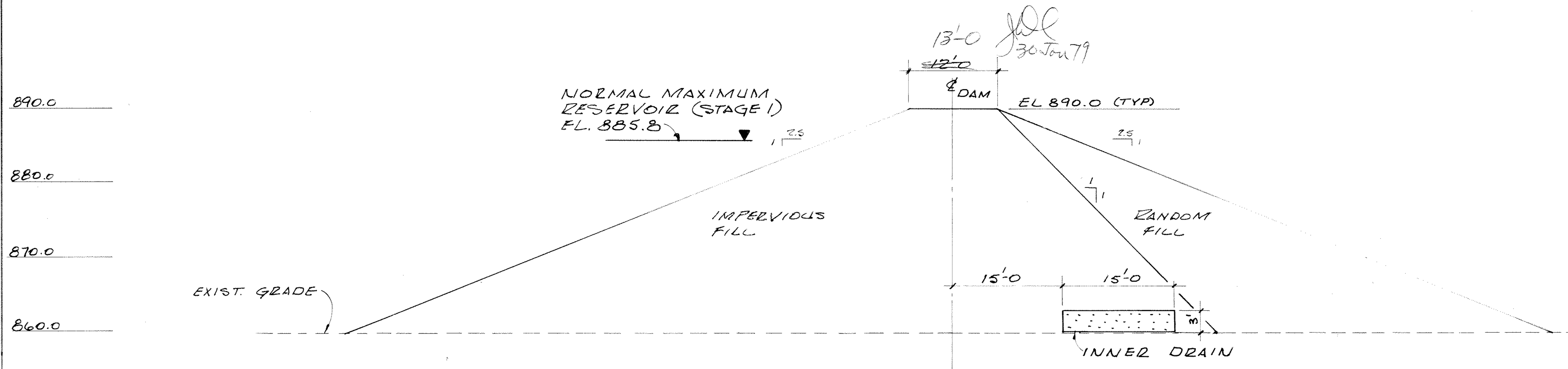
108+00
SECTION FF



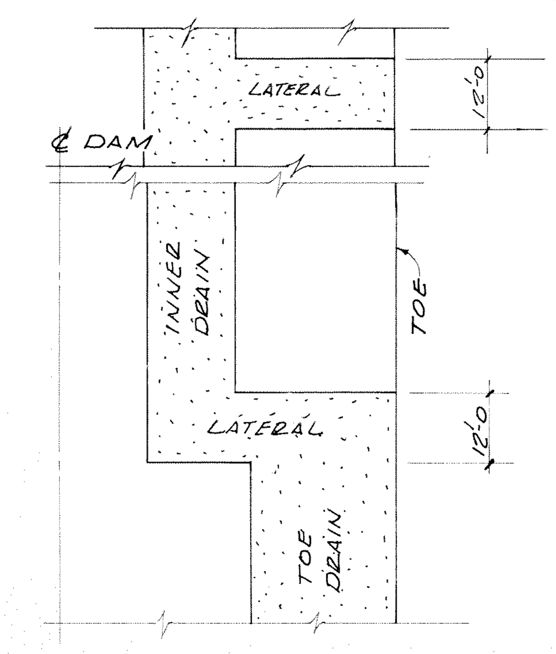
28+00
SECTION BB



98+00
SECTION EE



11+00
SECTION AA



TRANSITIONAL DETAIL
SCALE: 1" = 20'

APPROVED
This 30TH day of JANUARY 1979
Guy E. Gibson By Keller Cordon
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE
BOARD OF AGRICULTURE

0 10 20
SCALE FEET

NOTES:

1. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
2. ALL DIMENSIONS ARE IN UNITS OF FEET.
3. ELEVATIONS REFERENCED TO USC AND GS DATUM.

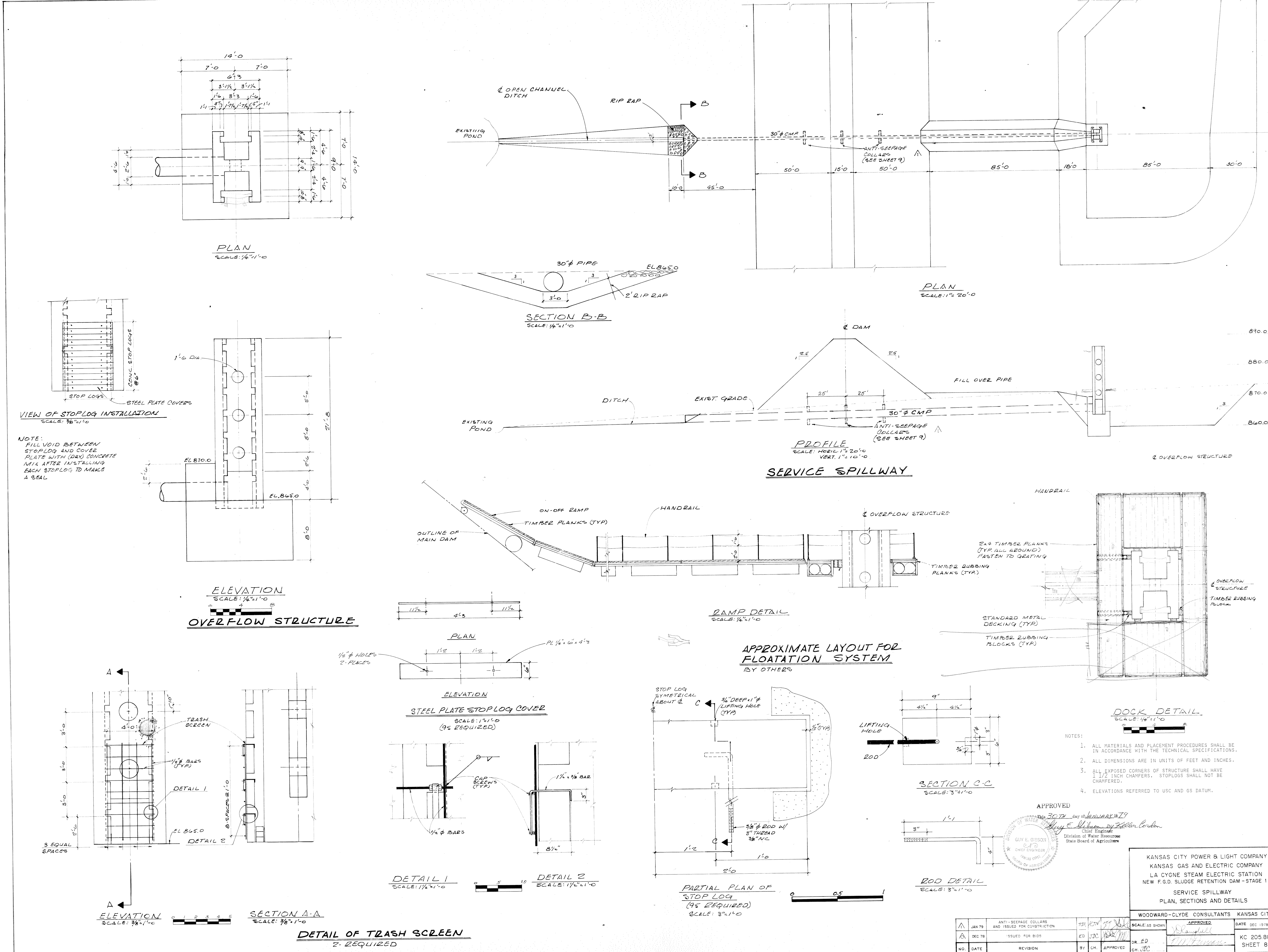
NO.	DATE	REVISION	BY	CH.	APPROVED
1	JAN 79	LOCATION OF DRAINS AND ISSUED FOR CONSTRUCTION	KM	KJN	KM JDC
0	DEC 78	ISSUED FOR BIDS	ED	JDC	JDC MM

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

DAM EMBANKMENT
SECTIONS AND DETAILS

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

SCALE AS SHOWN
APPROVED
DATE DEC 1978
DR. ED
CH. JDC
KC 205.80
SHEET 7



NOTES:

1. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
2. ALL DIMENSIONS ARE IN UNITS OF FEET AND INCHES.
3. ALL EXPOSED CORNERS OF STRUCTURE SHALL HAVE 1 1/2 INCH CHAMFERS. STOPLOGS SHALL NOT BE CHAMFERED.
4. ELEVATIONS REFERRED TO USC AND GS DATUM.

APPROVED

This 30TH day of JANUARY 1979

Guy E. Gibson by Keller Cordon

Chief Engineer

Division of Water Resources

State Board of Agriculture

DIVISION OF WATER RESOURCES GUY E. GIBSON CHIEF ENGINEER KANSAS STATE BOARD OF AGRICULTURE

KANSAS CITY POWER & LIGHT COMPANY

KANSAS GAS AND ELECTRIC COMPANY

LA CYGNE STEAM ELECTRIC STATION

NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

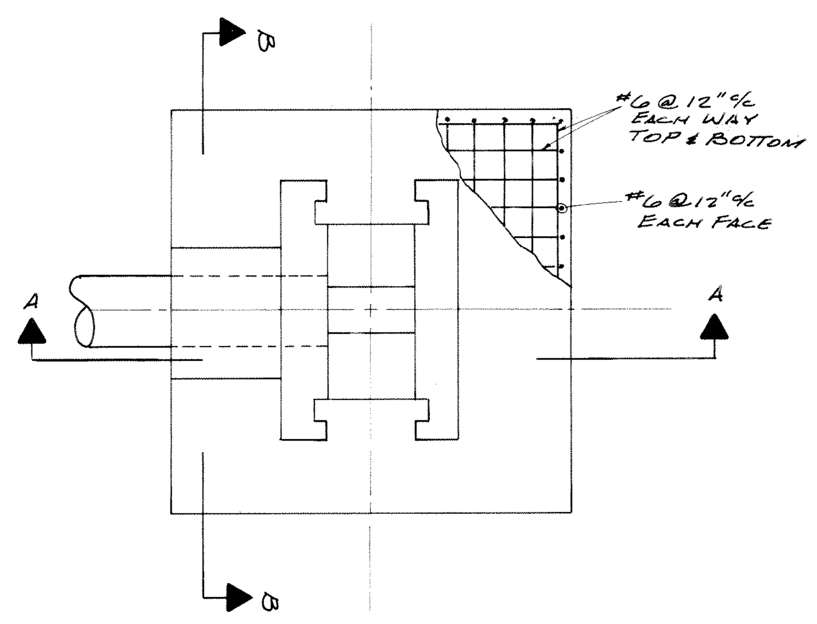
SERVICE SPILLWAY

PLAN, SECTIONS AND DETAILS

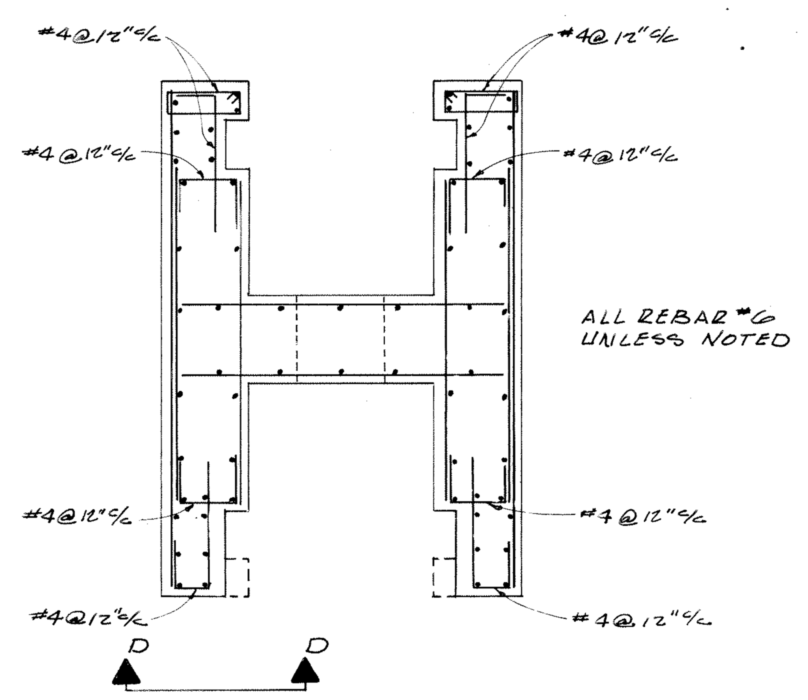
WOODWARD-CLYDE CONSULTANTS KANSAS CITY

SCALE: AS SHOWN	APPROVED	DATE DEC 1978
DR. ED CH. JDC		KC 205.80 SHEET 8

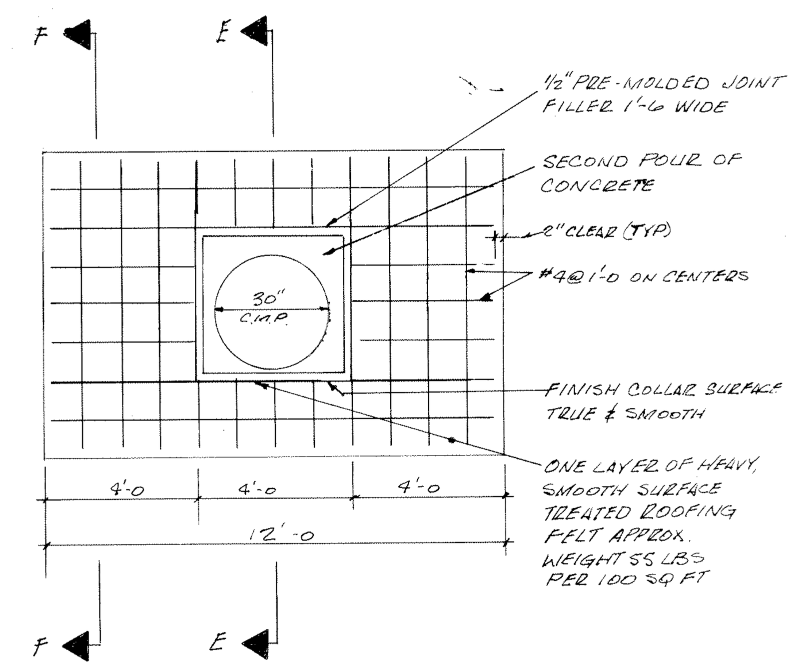
NO.	DATE	REVISION	BY	CH.	APPROVED
1	JAN 79	ANTI-SEEPAGE COLLARS AND ISSUED FOR CONSTRUCTION	KM	KJN	
0	DEC 78	ISSUED FOR BIDS	ED	JDC	



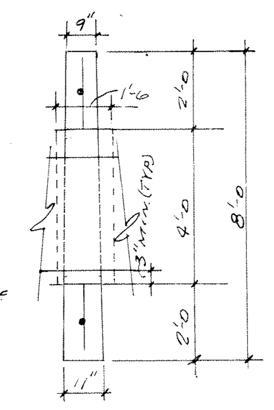
PLAN
SCALE: 1/8"=1'-0



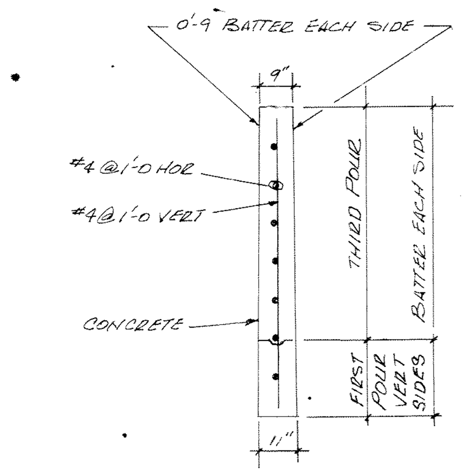
SECTION C-C
SCALE: 1/8"=1'-0



TYPICAL ANTI SEEPAGE COLLAR
(SEE SHEET 8)

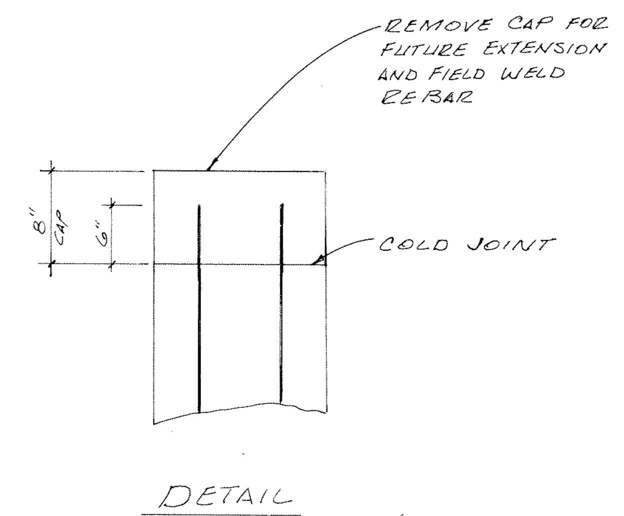


SECTION E-E

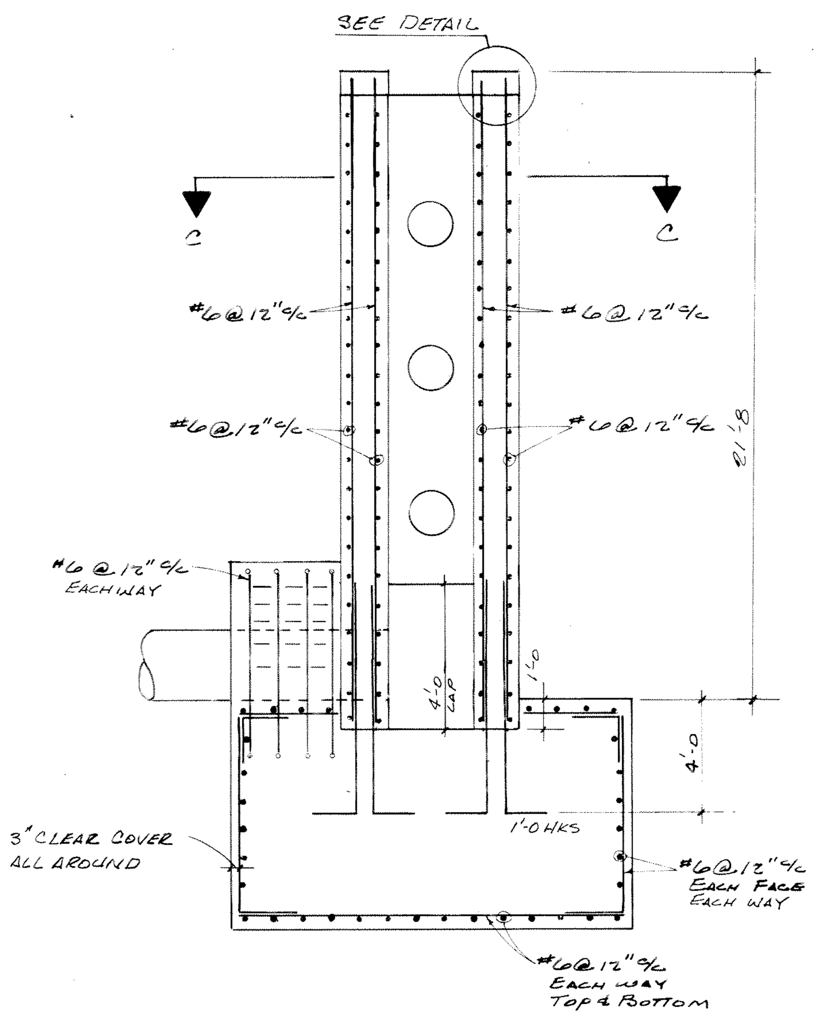


NOTE:
SIDES OF ANTI-SEEP COLLARS TO BE FORMED ABOVE FIRST POUR.

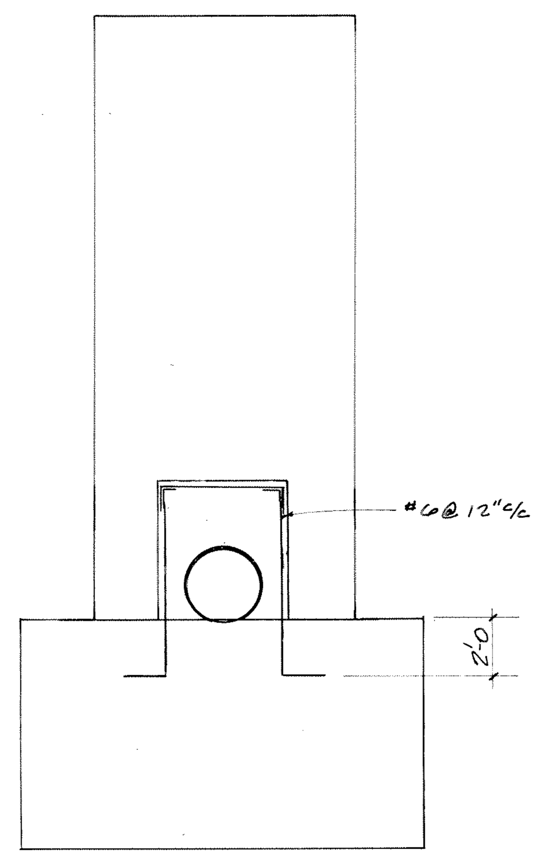
SECTION F-F



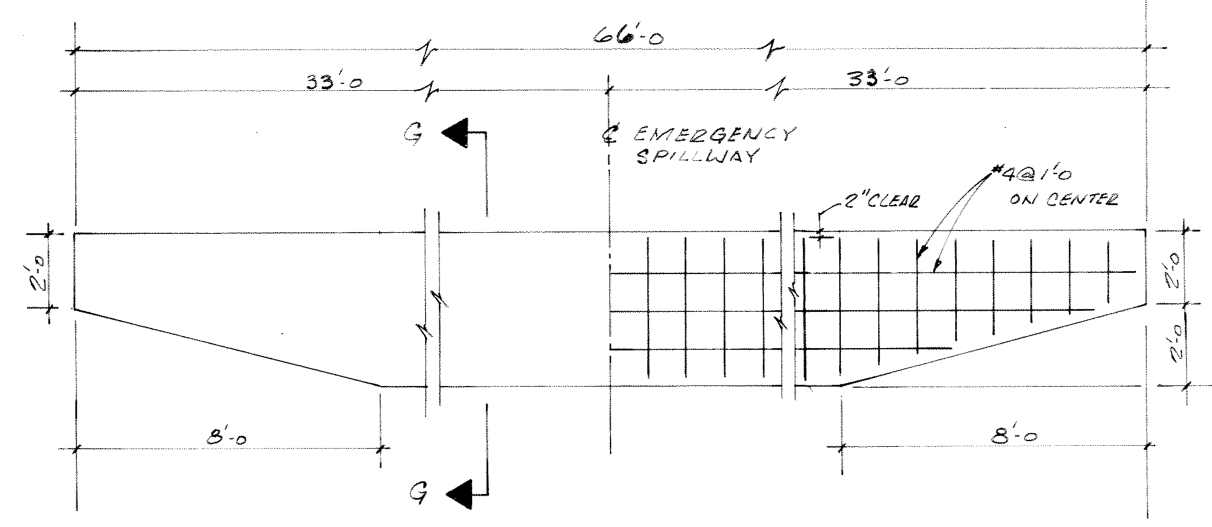
DETAIL



SECTION A-A
SCALE: 1/8"=1'-0

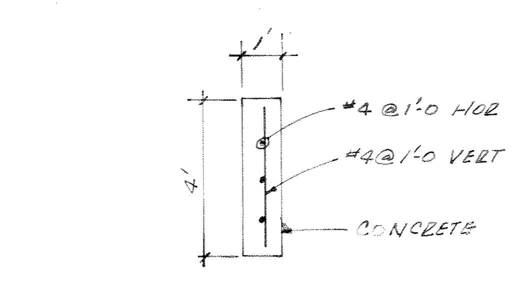


SECTION B-B
SCALE 1/8"=1'-0

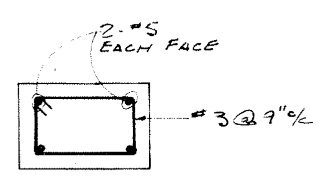


SEEPAGE CUTOFF WALL ON EMERGENCY SPILLWAY
(SEE SHEET 7)

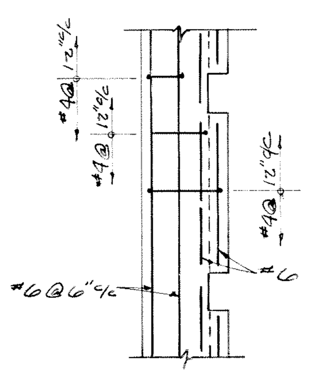
NOTES:
SIDES OF SEEPAGE CUTOFF WALL TO BE FORMED ABOVE EMBANKMENT



SECTION G-G



TYP STOP LOG SECTION
SCALE: 1 1/2"=1'-0



ELEVATION D-D
SCALE: 1/4"=1'-0

NOTES:

1. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
2. ALL DIMENSIONS ARE IN UNITS OF FEET AND INCHES.
3. SPLICES IN REINFORCING STEEL SHALL BE LAPPED OVER A LENGTH OF NOT LESS THAN 12 INCHES.
4. ALL EXPOSED STEEL SHALL BE PROTECTED FROM CORROSION BY A MINIMUM OF TWO COATS LEAD BASED PAINT.
5. ELEVATIONS REFERRED TO USC AND GS DATUM.
6. DEFORMED BILLET STEEL REINFORCING BARS SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATION A615-68, GRADE 60 STEEL EXCEPT USE GRADE 40 STEEL FOR MULTIPLE BEND BARS.

APPROVED
this 30TH day of JANUARY 1979
Guy E. Gibson By Keller Cordon
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

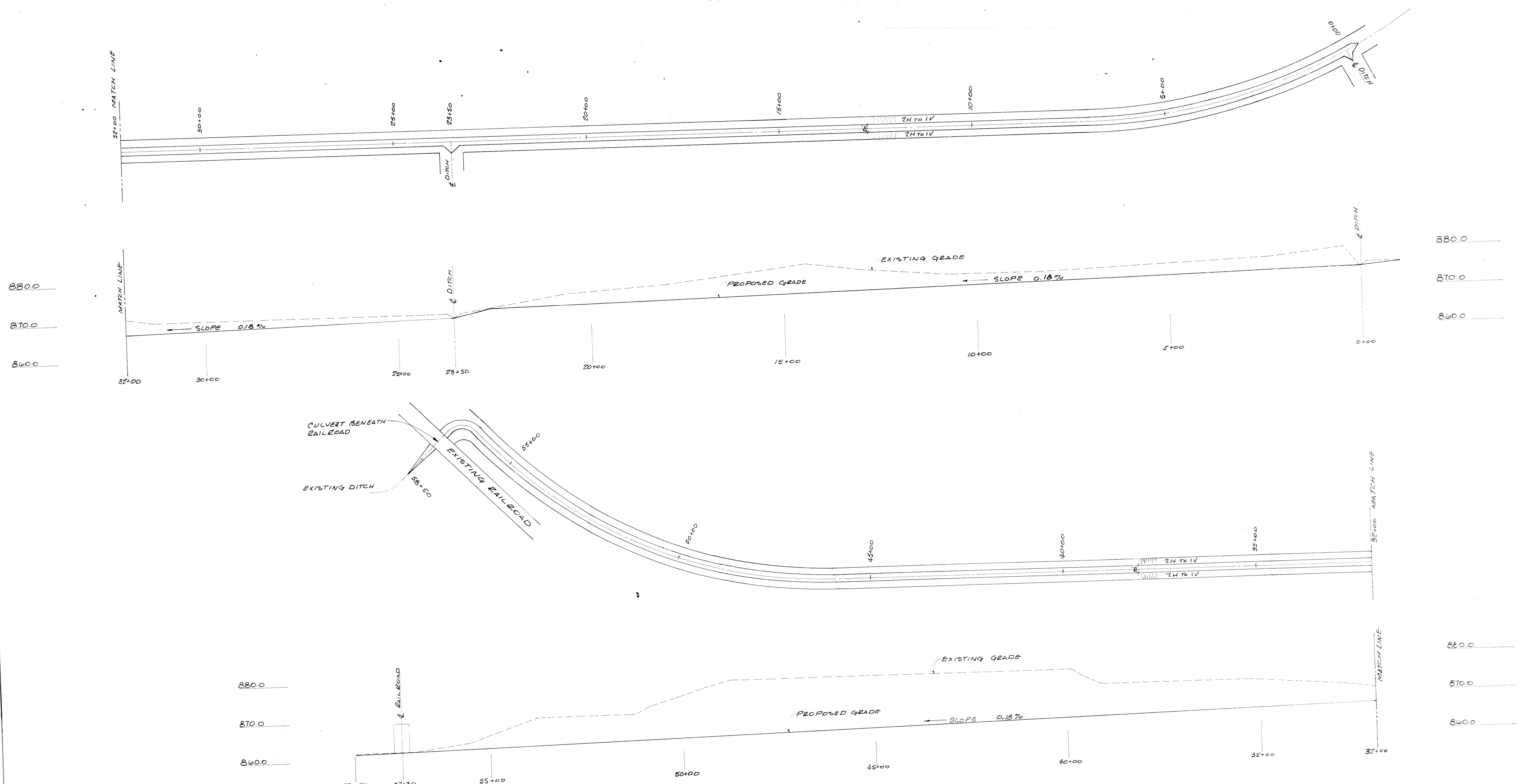
KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

SERVICE SPILLWAY
REINFORCING

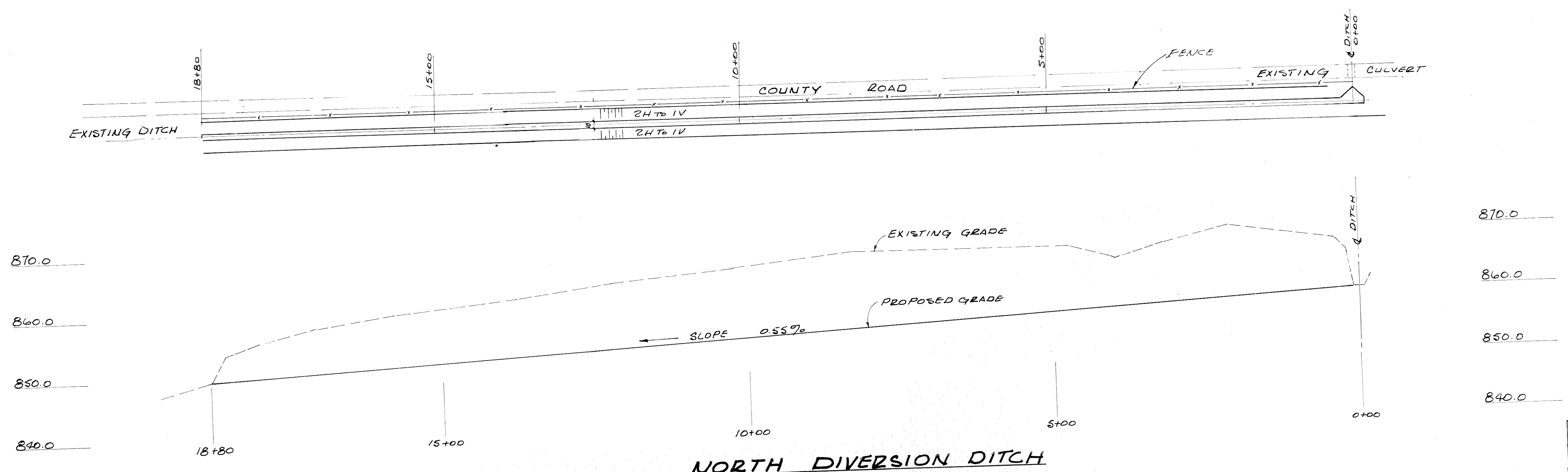
WOODWARD-CLYDE CONSULTANTS KANSAS CITY

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION	KM	KJN	[illegible]
0	DEC 78	ISSUED FOR BIDS	ED	JDC	[illegible]

SCALE AS SHOWN
APPROVED J. Campbell
DATE DEC 1978
DR. ED
CH. JDC
KC 205.80
SHEET 9



EAST DIVERSION DITCH



NORTH DIVERSION DITCH

NOTES:

1. ALL DITCH AREAS SHALL BE LANDSCAPED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. LANDSCAPING OF DITCHES SHALL CONSIST OF APPLYING FERTILIZER, SEED AND MULCH.
2. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
3. ALL DIMENSIONS ARE IN UNITS OF FEET.
4. ELEVATIONS REFERENCED TO USC AND GS DATUM.

0 100 200
SCALE: FEET

APPROVED
This 30TH day of JANUARY 1979
Guy E. Gibson by Keller Cordon
Chief Engineer
Division of Water Resources
State Board of Agriculture

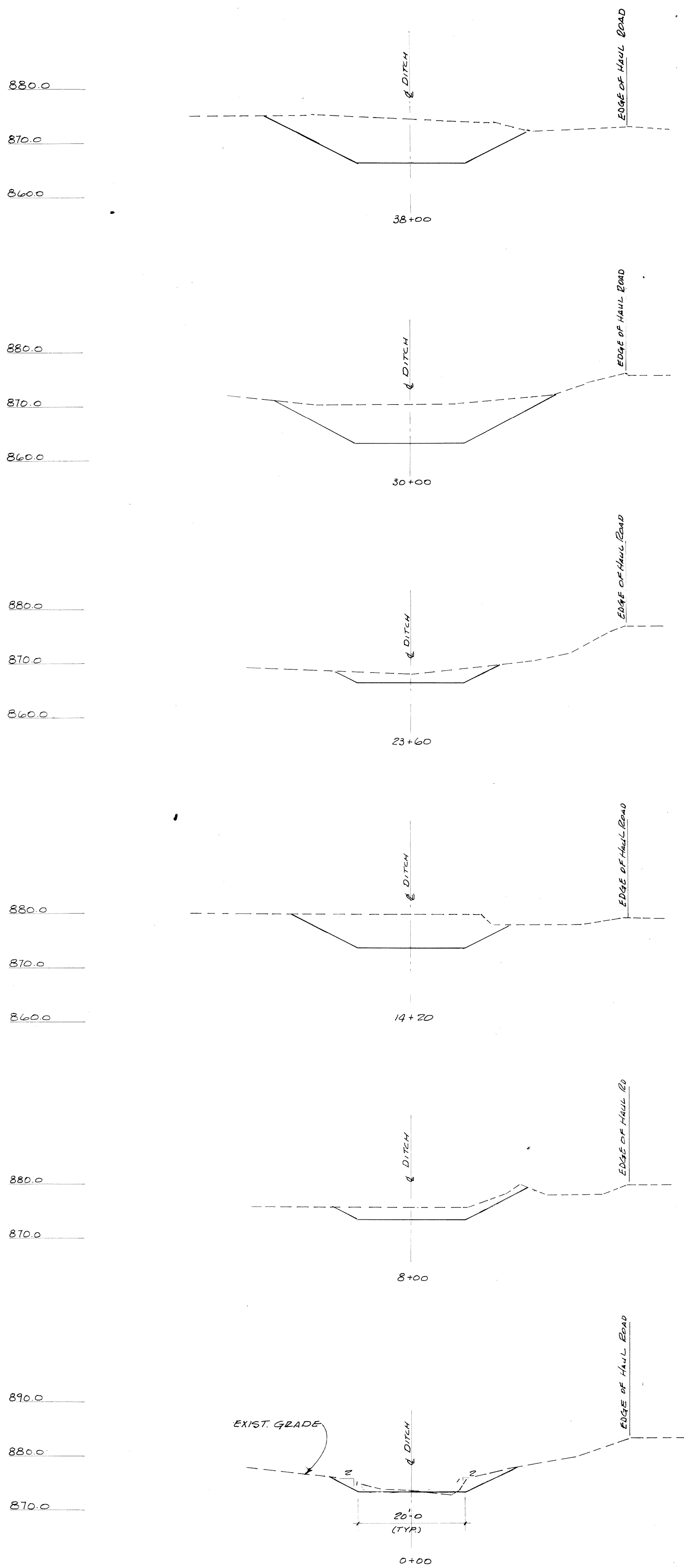
DIVISION OF WATER RESOURCES · GUY E. GIBSON · CHIEF ENGINEER · KANSAS STATE BOARD OF AGRICULTURE

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1
DIVERSION DITCHES
PLAN AND PROFILE

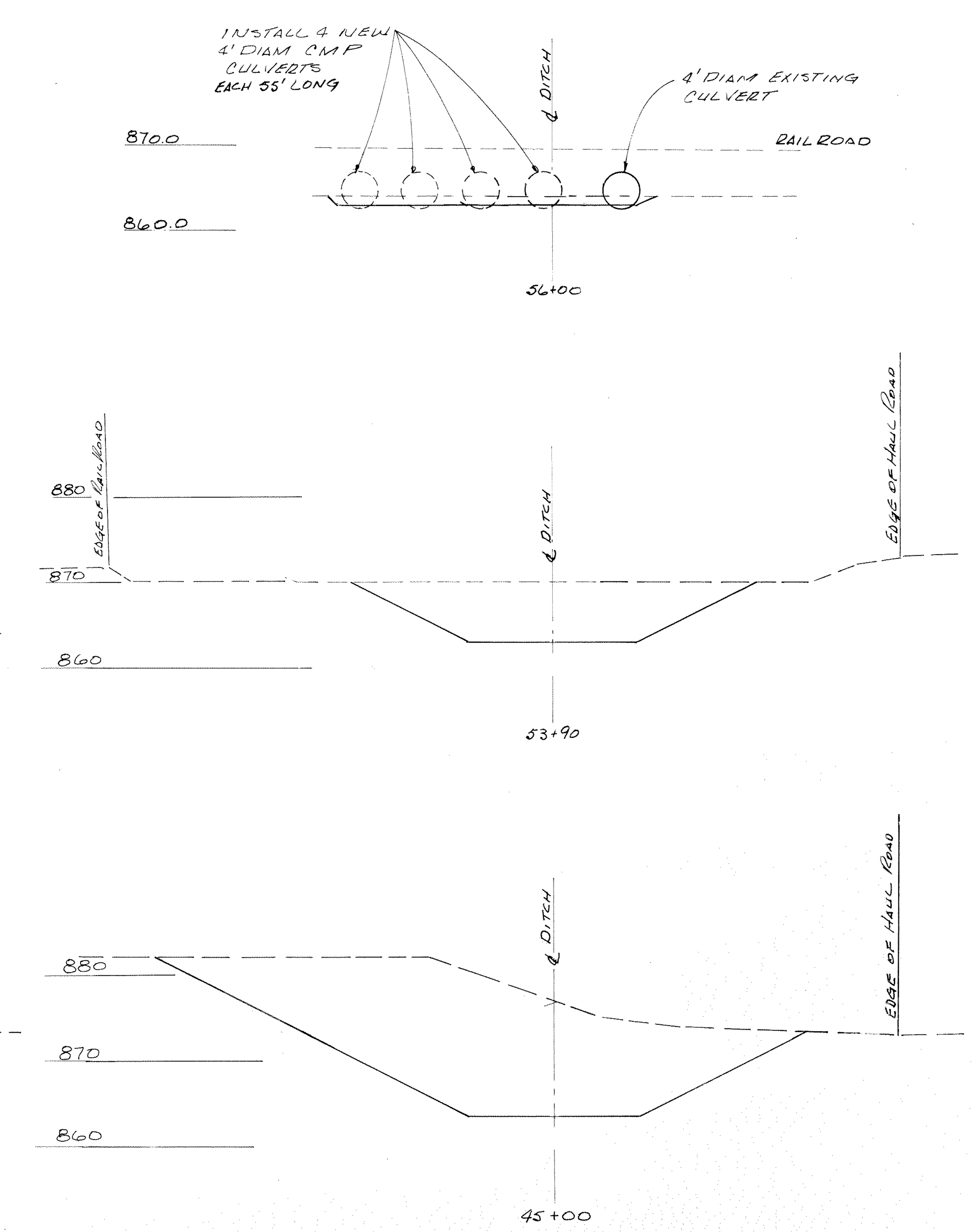
WOODWARD-CLYDE CONSULTANTS KANSAS CITY

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION	KJN	KJN	
0	DEC 78	ISSUED FOR BIDS	ED	JDC	

SCALE: AS SHOWN
DR. ED
CH. JDC
APPROVED
DATE: DEC 1978
KC 205.80
SHEET 10

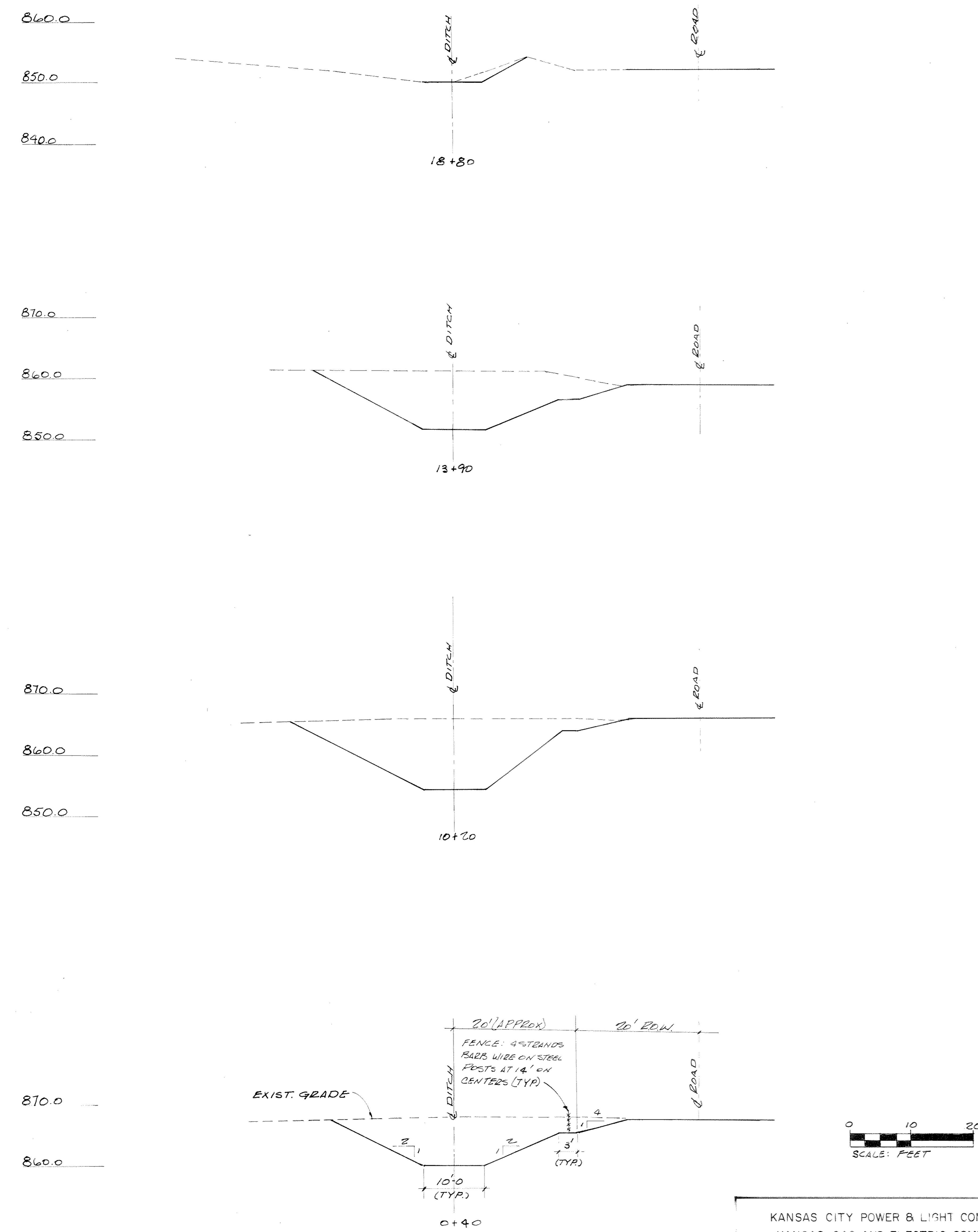


EAST DITCH



NOTES:

1. ALL DITCH AREAS SHALL BE LANDSCAPED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. LANDSCAPING OF DITCHES SHALL CONSIST OF APPLYING FERTILIZER, SEED AND MULCH.
2. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
3. ALL DIMENSIONS ARE IN UNITS OF FEET.
4. ELEVATIONS REFERENCED TO USC AND GS DATUM.



NORTH DITCH

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

DIVERSION DITCHES
SECTIONS AND DETAILS

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION		KTN	
0	DEC 78	ISSUED FOR BIDS	ED	JDC	

SCALE: AS SHOWN
APPROVED
DATE DEC 1978
DR. ED
CH. JDC
KC 205.80
SHEET 11

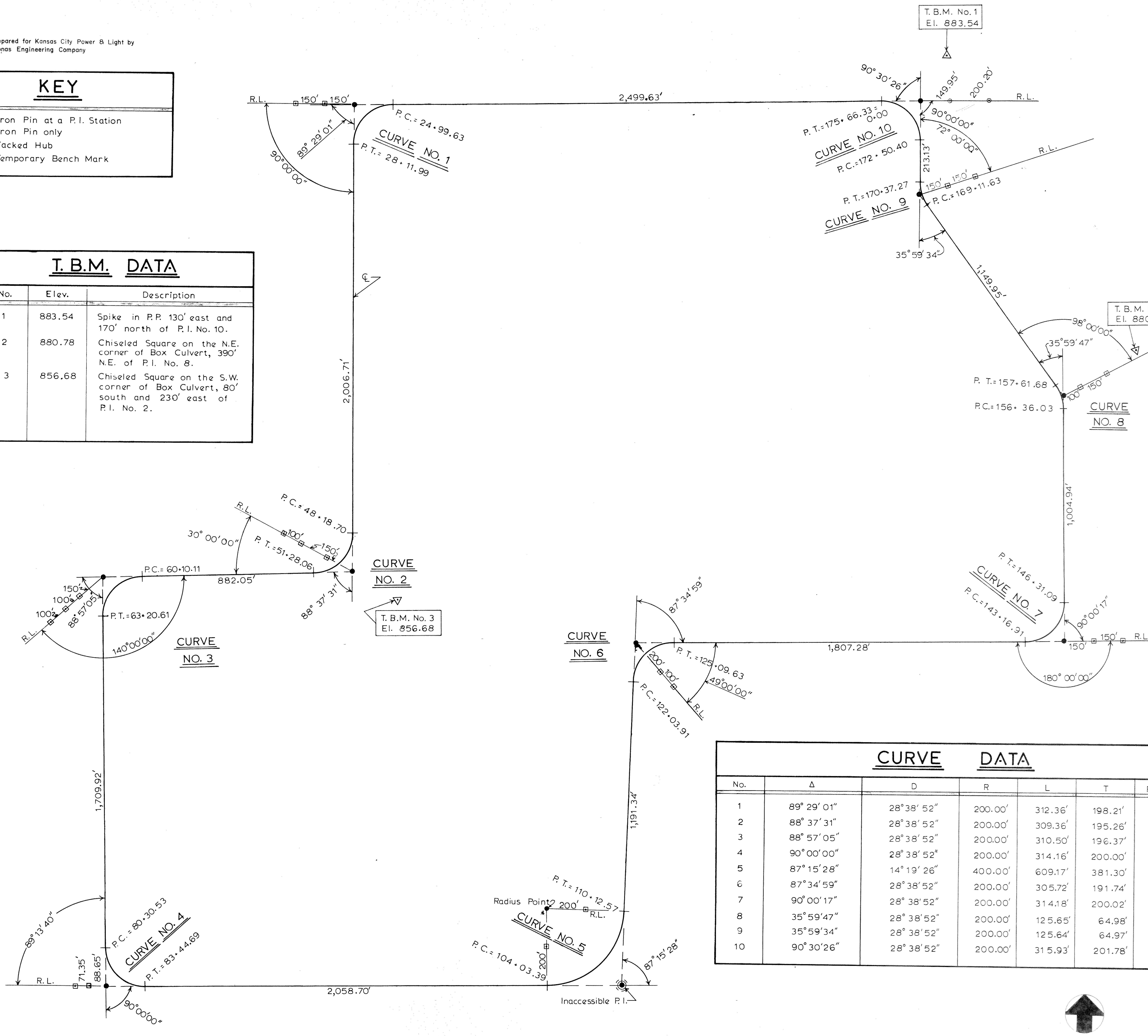
Survey Control prepared for Kansas City Power & Light by
Jonas Engineering Company

KEY

- ● = Iron Pin at a P. I. Station
- ⊙ = Iron Pin only
- ⊡ = Tacked Hub
- △ = Temporary Bench Mark

T. B.M. DATA

No.	Elev.	Description
1	883.54	Spike in P.P. 130' east and 170' north of P. I. No. 10.
2	880.78	Chiseled Square on the N.E. corner of Box Culvert, 390' N.E. of P. I. No. 8.
3	856.68	Chiseled Square on the S.W. corner of Box Culvert, 80' south and 230' east of P. I. No. 2.



CURVE DATA

No.	Δ	D	R	L	T	P. I. Station
1	89° 29' 01"	28° 38' 52"	200.00'	312.36'	198.21'	26 + 97.84
2	88° 37' 31"	28° 38' 52"	200.00'	309.36'	195.26'	50 + 13.95
3	88° 57' 05"	28° 38' 52"	200.00'	310.50'	196.37'	62 + 06.48
4	90° 00' 00"	28° 38' 52"	200.00'	314.16'	200.00'	82 + 30.53
5	87° 15' 28"	14° 19' 26"	400.00'	609.17'	381.30'	107 + 84.69
6	87° 34' 59"	28° 38' 52"	200.00'	305.72'	191.74'	123 + 95.65
7	90° 00' 17"	28° 38' 52"	200.00'	314.18'	200.02'	145 + 16.93
8	35° 59' 47"	28° 38' 52"	200.00'	125.65'	64.98'	157 + 01.01
9	35° 59' 34"	28° 38' 52"	200.00'	125.64'	64.97'	169 + 76.60
10	90° 30' 26"	28° 38' 52"	200.00'	315.93'	201.78'	174 + 52.18

SCALE FEET

KANSAS C
KANSAS
LA CYG
NEW F G

Lacygne KS

KCP&L Power Plant

August 23rd, 2010

www.acepipe.com
1-800-325-9372

4000 Truman Road
Kansas City, MO 64127

Televised Inspection

Ace Pipe Cleaning, Inc.

Brian Linnan
Project Manager

Ace Pipe Cleaning, Inc.
Trevor Smith
Data Manager
tsmith@acepipe.com
Phone: (816) 241-2891
Fax: (816) 241-5054

www.acepipe.com
1-800-325-9372

4000 Truman Road
Kansas City, MO 64127

Televised Inspection

Ace Pipe Cleaning, Inc.

The Environmental Protection Specialists

Ace Pipe Cleaning, Inc.
4000 E Truman Rd
Kansas City, MO 64127
Tel: (816) 241-2891, Fax: (816) 241-5054

Defect Grade Description

Project name:	Contract number:	Contact:	Date:
KCPL Power Plant	0	Lacygne	08/23/2010

1: Failure unlikely in the forseeable future.

EXCELLENT: MINOR DEFECTS.

2: Pipe unlikely to fail for at least 20 years.

GOOD: DEFECTS THAT HAVE NOT BEGUN TO DETERIORATE.

3: Pipe may fail in 10 to 20 years.

FAIR: MODERATE DEFECTS THAT WILL CONTINUE TO DETERIORATE.

4: Pipe will probably fail in 5 to 10 years.

POOR: SEVERE DEFECTS THAT WILL BECOME GRADE 5 DEFECTS WITHIN THE FORSEEABLE FUTRE.

5: Pipe has failed or will likely fail within the next 5 years.

IMMEDIATE ATTENTION: DEFECTS REQUIRING IMMEDIATE ATTENTION.

The Environmental Protection Specialists

Ace Pipe Cleaning, Inc.
4000 E Truman Rd
Kansas City, MO 64127
Tel: (816) 241-2891, Fax: (816) 241-5054

Inspection report

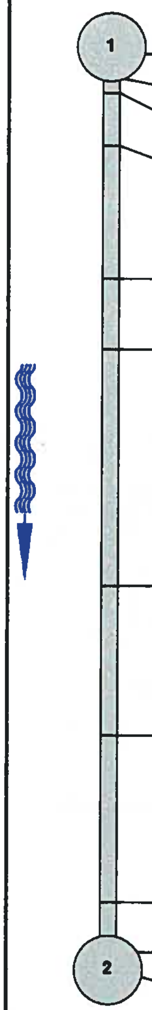
Date:	P.O.#:	Weather:	Surveyed By:	section number:	PSR:
08/23/2010		1 Dry	BURNETT	1	
Total Pipe Length:	Survey Customer:	System Owner:	Clean Date:	Pre-Cleaned: N No Pre-Cleaning	rate:

Street:	KCPL GEN PLT	Flow Control:		Start MH:	1
City:	LACYGNE KS	Year Renewed		End MH:	2
Location Code:	Z Other	Tape/Media #:	082310 KCPL	Total length surveyed:	265 ft

Purpose:	F Routine Assessment	Dia/Height:	C Circular 30"/30"
Use:	ZZ Other	Material:	CMP Corrugated Metal Pipe Pipe Joint length:
Drain. Area:		Lining:	
		Category:	

Comment:

Location details:



1:600	position	code	observation	MPEG	photo	grade
	1.90	AMH	Manhole	00:00:45	1, b	
	8.80	DNZ	Deposits Ingress Other, 1 % of cross sectional area, from 04 to 05 o´clock, within 8 inch: YES	00:01:57	3	M 2
	13.20	DAE	Deposits Attached Encrustation, 2 % of cross sectional area, from 04 to 07 o´clock, within 8 inch: YES	00:02:28	4	M 2
	28.30	MGO	General Observation	00:02:47	5, b	
	66.60	MGO	General Observation	00:03:52	7	
	86.70	MGO	General Observation	00:04:19	8	
	154.80	MGO	General Observation	00:05:53	9	
	197.70	DAZ	Deposits Attached Other, 1 % of cross sectional area, at 03 o´clock, within 8 inch: NO	00:07:54	10	M 2
	245.40	MGO	General Observation, within 8 inch: NO	00:09:54	11, b	
	259.90	MGO	General Observation	00:10:25	13, b	
	265.00	AOC	Special Chamber	00:00:30	15	

QSR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	2300	0	6	6	0	2	2

The Environmental
Protection Specialists

Ace Pipe Cleaning, Inc.
4000 E Truman Rd
Kansas City, MO 64127
Tel: (816) 241-2891, Fax: (816) 241-5054

Inspection photos

City:	Street:	Date:	section number:	PSR:
LACYGNE KS	**KCPL GEN PLT**	**08/23/2010**	1	

Photo: 1, Tape/Media No.: 082310 KCPL, 00:00:45
1.9FT, Manhole

Photo: 2, Tape/Media No.: 082310 KCPL, 00:00:45
1.9FT, Manhole

Photo: 3, Tape/Media No.: 082310 KCPL, 00:01:57
8.8FT, Deposits Ingress Other, 1 % of cross sectional area, from 04 to 05 o´clock, within 8 inch: YES

Photo: 4, Tape/Media No.: 082310 KCPL, 00:02:28
13.2FT, Deposits Attached Encrustation, 2 % of cross sectional area, from 04 to 07 o´clock, within 8 inch: YES

The Environmental Protection Specialists

Ace Pipe Cleaning, Inc.
4000 E Truman Rd
Kansas City, MO 64127
Tel: (816) 241-2891, Fax: (816) 241-5054

Inspection photos

City:	Street:	Date:	section number:	PSR:
LACYGNE KS	KCPL GEN PLT	08/23/2010	1	

Photo: 5, Tape/Media No.: 082310 KCPL, 00:02:47
28.3FT, General Observation

Photo: 6, Tape/Media No.: 082310 KCPL, 00:02:47
28.3FT, General Observation

Photo: 7, Tape/Media No.: 082310 KCPL, 00:03:52
66.6FT, General Observation

Photo: 8, Tape/Media No.: 082310 KCPL, 00:04:19
86.7FT, General Observation

The Environmental Protection Specialists

Ace Pipe Cleaning, Inc.
4000 E Truman Rd
Kansas City, MO 64127
Tel: (816) 241-2891, Fax: (816) 241-5054

Inspection photos

City:	Street:	Date:	section number:	PSR:
LACYGNE KS	KCPL GEN PLT	08/23/2010	1	

Photo: 9, Tape/Media No.: 082310 KCPL, 00:05:53
154.8FT, General Observation

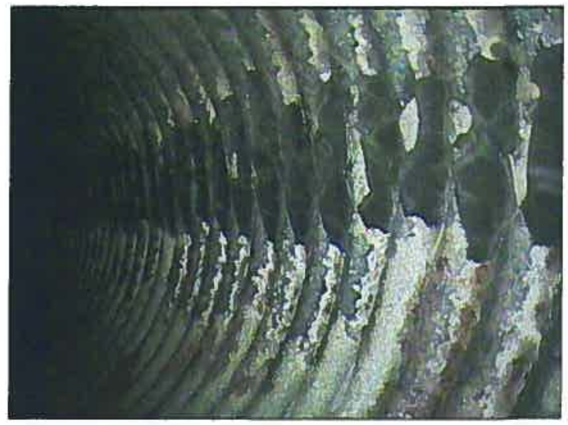


Photo: 10, Tape/Media No.: 082310 KCPL, 00:07:54
197.7FT, Deposits Attached Other, 1 % of cross sectional area, at 03 o´clock, within 8 inch: NO

Photo: 11, Tape/Media No.: 082310 KCPL, 00:09:54
245.4FT, General Observation, within 8 inch: NO

Photo: 12, Tape/Media No.: 082310 KCPL, 00:09:54
245.4FT, General Observation, within 8 inch: NO

The Environmental Protection Specialists

Ace Pipe Cleaning, Inc.
4000 E Truman Rd
Kansas City, MO 64127
Tel: (816) 241-2891, Fax: (816) 241-5054

Inspection photos

City:	Street:	Date:	section number:	PSR:
LACYGNE KS	KCPL GEN PLT	08/23/2010	1	

Photo: 13, Tape/Media No.: 082310 KCPL, 00:10:25
259.9FT, General Observation

Photo: 14, Tape/Media No.: 082310 KCPL, 00:10:25
259.9FT, General Observation

Photo: 15, Tape/Media No.: 082310 KCPL, 00:00:30
265FT, Special Chamber

May 15, 2009

Via Express Mail

Mr. Richard Kinch
US Environmental Protection Agency
Two Potomac Yard
2733 S. Crystal Dr.
5th Floor; N-5738
Arlington, VA 22202-2733

Re: Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9604(e)

Dear Mr. Kinch:

Enclosed is the response of Kansas City Power & Light Company (KCP&L) to EPA's Section 104 (e) request for information that was received May 4, 2009 regarding a bottom ash settling pond and scrubber sludge pond at KCP&L's La Cygne Generating Station. The bottom ash settling pond is for settling and not disposal. The bottom ash is removed from the bottom ash settling pond and beneficially used off-site. The scrubber sludge pond is part of the permitted landfill.

I certify that the information contained in this response to EPA's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of this response for which I cannot personally verify their accuracy, I certify under penalty of law that this response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

If you have any questions regarding this response, please contact me at 913-757-4451.

Sincerely,

Bill Radford

Bill Radford
Plant Manager
La Cygne Generating Station

Enclosure A

Enclosure A

Kansas City Power & Light Company **May 15, 2009**
La Cygne Generating Station
Management Unit: Bottom Ash Settling Pond

Please provide the information requested below for each surface impoundment or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. This includes units that no longer receive coal combustion residues or by-products, but still contain free liquids.

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.

The Management Unit does not have a known rating. The Kansas Department of Health and Environment regulates solid waste facilities in Kansas.

2. What year was each management unit commissioned and expanded?

The Management Unit was commissioned approximately in 1977 and has not been expanded. Bottom ash is removed from the Management Unit and beneficially used or deposited into an on-site permitted landfill.

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash: (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other," please specify the other types of materials that are temporarily or permanently contained in the unit(s).

Bottom Ash.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management unit(s) under the supervision of a Professional Engineer?

The Management Unit was not designed by a known Professional Engineer nor was the construction of the Management Unit under the supervision of a known Professional Engineer. Inspection and monitoring of the safety of the Management Unit is not completed under the supervision of a Professional Engineer.

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the

management unit(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

The Management Unit is visually inspected on approximately a weekly basis by operational or security personnel. There has been no known assessment or evaluation of the safety (i.e., structural integrity) of the Management Unit beyond the visual inspection. There have been no known actions taken or planned by facility personnel as a result of the visual inspections of the Management Unit. There are no planned assessments or evaluation of this Management Unit in the future beyond the visual inspections.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

There have been no known State or Federal regulatory official inspection or evaluation of the safety (structural integrity) the Management Unit. We are not aware of a planned state or federal inspection or evaluation in the future.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management unit(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

There have been no known assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year that uncovered a safety issue(s) with the Management Unit.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of material currently stored in each of the management unit(s)? Please provide the date that the volume measurement(s) was taken. Please provide the maximum height of the management units(s). The basis for determining the maximum height is explained later in this Enclosure.

The Management Unit's surface area is approximately 1.7 acres and the total storage capacity is approximately 19,000 cubic yards. The capacity measurements were made as of 2009. The volume of material currently stored in the Management Unit is estimated today to be approximately 1,500 cubic yards; although the bottom ash is removed approximately every two weeks. The Management Unit's Dam Height, pursuant to Enclosure A, is approximately 12 feet.

9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

There have been no known spills or unpermitted releases from the Management Unit within the last ten years.

10. Please identify all current legal owner(s) and operator(s) at the facility.

The current legal owners of Iatan Generating Station are Kansas City Power & Light Company and Kansas Gas and Electric Company. The current operator of the LaCygne Generating Station is Kansas City Power & Light Company.

Enclosure A

Kansas City Power & Light Company **May 15, 2009**
La Cygne Generating Station
Management Unit: Scrubber Sludge Ponds

Please provide the information requested below for each surface impoundment or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. This includes units that no longer receive coal combustion residues or by-products, but still contain free liquids.

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.

The Management Unit does not have a known rating. The Kansas Department of Health and Environment regulates solid waste facilities in Kansas.

2. What year was each management unit commissioned and expanded?

The Management Unit was commissioned approximately in 1971 and expanded in 1979.

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash: (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other," please specify the other types of materials that are temporarily or permanently contained in the unit(s).

Fly ash and flue gas emission control residuals.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management unit(s) under the supervision of a Professional Engineer?

The Management Unit original pond and expansion pond were designed by a Professional Engineer. The construction drawings for the Management Unit were sealed by a Professional Engineer. Inspection and monitoring of the safety of the Management Unit is completed under the supervision of a Professional Engineer.

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the management unit(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of

these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

The Management Unit is visually inspected on approximately a weekly basis by operational or security personnel. The last visual assessment or evaluation of the safety (i.e., structural integrity) of the Management Unit by a Professional Engineer was in Spring 2009. There has been no known assessment or evaluation of the safety (i.e., structural integrity) of the Management Unit beyond these visual inspections. There have been no known actions taken or planned by facility personnel as a result of the visual inspections of the Management Unit. There are no planned assessments or evaluation of this Management Unit in the future beyond the visual inspections.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

There have been no known State or Federal regulatory official inspection or evaluation of the safety (structural integrity) the Management Unit; although, the Kansas Department of Health and Environment conducts an annual inspection of the permitted landfill which includes this Management Unit. We are not aware of a planned state or federal inspection or evaluation in the future beyond the Kansas Department of Health and Environment's annual inspection of the permitted landfill which includes this Management Unit.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management unit(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

There has been no known assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year that uncovered a safety issue(s) with the Management Unit.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of material currently stored in each of the management unit(s)? Please provide the date that the volume measurement(s) was taken. Please provide the maximum height of the management units(s). The basis for determining the maximum height is explained later in this Enclosure.

The Management Unit's surface area is approximately 483 acres and the total storage capacity is approximately 15,000,000 cubic yards. The capacity measurements were made as of 2009. The volume of material currently stored in the Management Unit is estimated today to

be approximately 11,000,000 cubic yards. The Management Unit's Dam Height, pursuant to Enclosure A, is approximately 45 feet.

9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

In July 2007, September of 2007, and May 2009 there were unpermitted releases of recirculation water from the Management Unit due to unusual rainfall events. The water decanted from an emergency spillway. Normally, the Management Unit is nondischarging because the water is recirculated to the generation unit or evaporates.

10. Please identify all current legal owner(s) and operator(s) at the facility.

The current legal owners of La Cygne Generating Station are Kansas City Power & Light Company and Kansas Gas and Electric Company. The current operator of the LaCygne Generating Station is Kansas City Power & Light Company.

June 3, 2009

Mr. Eric C. Staab, PE
Kansas Department of Health and Environment
Bureau of Water
1000 S.W. Jackson, Suite 420
Topeka, Kansas 66612-1367

Re: Air Quality Control (AQP) Pond Emergency Discharge
Kansas City Power & Light (KCP&L) Company
La Cygne Generating Station
La Cygne, Kansas

Dear Mr. Staab:

As a follow-up to a May 4, 2009 e-mail sent to you from Paul Ling, KCP&L Environmental Manager, attached are the monitoring results of the emergency discharge from the AQC pond at KCP&L's La Cygne Generating Station. Normally, the AQC impoundments operate in a no-discharge, recycle/evaporative mode. However, due to the unusually heavy spring rains in the La Cygne area, an emergency discharge from the AQC pond system was necessary to protect the embankments and avoid a catastrophic release.

Water was released from the AQC pond continuously from May 4 through May 15 and for a brief period on May 16. Due to an oversight, a Total Suspended Solids analysis was not conducted on the first day sample and sulfide instead of sulfate was analyzed for the first three daily samples.

Please contact me at (816) 654-1767 if you have any questions, comments or require any additional information.

Sincerely,

Robert C Beck

Robert C. Beck
Environmental Services

Attachment

cc: S. Lister
A. Stimatze
T. Goin

KCP&L AQC POND EMERGENCY DISCHARGE MONITORING REPORT

Facility Name: La Cygne Generating Station
County: Linn County
NPDES Permit Number: I-MC18-PO01

Discharge Period: May 4, 2009 to May 16, 2009
Month: May-09

Day	Air Quality Control (AQC) Pond Emergency Discharge								
	Flow (MGD)	Sampling Time	Temp (°F)	pH (SU)	TSS (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Mercury (ug/L)
1									
2									
3									
4	2.88	9:45 AM	64.9	7.79	NT	672	10.8	NT	<0.20
5	14.40	9:20 AM	66.2	7.8	28.0	711	10.9	NT	<0.20
6	5.76	10:00 AM	66.2	7.8	34.0	702	11.0	NT	<0.20
7	5.76	10:10 AM	68.0	7.9	18.0	741	11.3	2,800	<0.20
8	5.76	11:00 AM	68.0	7.9	58.0	694	10.5	2,710	<0.20
9	5.76	12:00 PM	69.8	7.9	49.0	722	10.9	2,650	<0.20
10	4.32	11:15 AM	68.0	7.9	55.0	671	10.1	2,580	<0.20
11	2.88	9:10 AM	66.2	7.9	27.0	666	10.2	2,590	<0.20
12	2.16	10:10 AM	66.2	8.0	60.0	601	11.7	2,300	<0.20
13	1.44	8:15 AM	68.0	7.9	60.0	586	11.5	2,260	<0.20
14	0.72	9:20 AM	68.0	7.9	56.0	587	11.4	2,330	<0.20
15	1.44	10:40 AM	71.6	7.9	119.0	626	11.2	2,320	<0.20
16	NT		NT	NT	NT	NT	NT	NT	NT
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
Measured Daily Max.	NA	NA	NA	NA	NA	NA	NA	NA	NA
Permitted Daily Max.	NA	NA	NA	NA	NA	NA	NA	NA	NA
Measured Daily Avg.	NA	NA	NA	NA	NA	NA	NA	NA	NA
Permitted Daily Avg.	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sample Frequency	D	D	D	D	D	D	D	D	D

NA = Not Applicable, NT = Not tested, D = Daily, TSS = Total Suspended Solids

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

May 14, 2009

Ms. Theresa Goin
KCPL Lacygne Station
25166 E. 2200 Rd.
Lacygne, KS 66040

RE: Project: AQC Lower Pond
Pace Project No.: 6058151

Dear Ms. Goin:
Enclosed are the analytical results for sample(s) received by the laboratory on May 04, 2009. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Connie Gardner

Connie Gardner

connie.gardner@pacelabs.com
Project Manager

Enclosures

cc: Bob Beck, KCPL Lacygne Station
Andrew Stimatze, KCPL Lacygne Station

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project: AQC Lower Pond
Pace Project No.: 6058151

Kansas Certification IDs

Utah Certification #: 9135995665
Texas Certification #: T104704407-08-TX
Oklahoma Certification #: 9205/9935
Nevada Certification #: KS000212008A
Louisiana Certification #: 03055

Kansas/NELAP Certification #: E-10116
Iowa Certification #: 118
Illinois Certification #: 001191
Arkansas Certification #: 05-008-0
A2LA Certification #: 2456.01

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: AQC Lower Pond
Pace Project No.: 6058151

Lab ID	Sample ID	Matrix	Date Collected	Date Received
6058151001	**AQC LOWER POND**	Water	05/04/09 09:45	05/04/09 11:19

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: AQC Lower Pond
Pace Project No.: 6058151

Lab ID	Sample ID	Method	Analysts	Analytes Reported
6058151001	**AQC LOWER POND**	EPA 300.0	RAB	2
		EPA 7470	SMW	1
		SM 4500-S-2 F	KPZ	1

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: AQC Lower Pond
Pace Project No.: 6058151

Sample: AQC LOWER POND **Lab ID: 6058151001** Collected: 05/04/09 09:45 Received: 05/04/09 11:19 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470							
Mercury	ND	ug/L	0.20	1	05/07/09 11:47	05/07/09 16:52	7439-97-6	
4500S2F Sulfide, Iodometric	Analytical Method: SM 4500-S-2 F							
Sulfide	ND	mg/L	0.50	1		05/11/09 16:15		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**672**	mg/L	50.0	50		05/12/09 17:03	16887-00-6	
Fluoride	**10.8**	mg/L	0.40	2		05/13/09 15:15	16984-48-8	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: AQC Lower Pond
Pace Project No.: 6058151

QC Batch: MERP/3501 — Analysis Method: EPA 7470
QC Batch Method: EPA 7470 — Analysis Description: 7470 Mercury
Associated Lab Samples: 6058151001

METHOD BLANK: 479174 — Matrix: Water
Associated Lab Samples: 6058151001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	ND	0.20	05/07/09 16:33	

LABORATORY CONTROL SAMPLE: 479175

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	5.0	100	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 479176 479177

Parameter	Units	6057955020 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	0.33	5	5	5.1	5.1	95	95	75-125	0	10	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: AQC Lower Pond
Pace Project No.: 6058151

QC Batch: WET/17514
Analysis Method: SM 4500-S-2 F
QC Batch Method: SM 4500-S-2 F
Analysis Description: 4500S2F Sulfide, Iodometric
Associated Lab Samples: 6058151001

METHOD BLANK: 480643
Matrix: Water
Associated Lab Samples: 6058151001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfide	mg/L	ND	0.50	05/11/09 16:15	

LABORATORY CONTROL SAMPLE: 480644

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfide	mg/L	10	10.4	104	80-120	

MATRIX SPIKE SAMPLE: 480645

Parameter	Units	6058263010 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfide	mg/L	ND	20	22.4	112	75-125	

SAMPLE DUPLICATE: 480646

Parameter	Units	6058263009 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfide	mg/L	ND	ND		15	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: AQC Lower Pond
Pace Project No.: 6058151

QC Batch: WETA/9834 | Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 | Analysis Description: 300.0 IC Anions
Associated Lab Samples: 6058151001

METHOD BLANK: 480996 | Matrix: Water
Associated Lab Samples: 6058151001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	ND	1.0	05/12/09 13:10	
Fluoride	mg/L	ND	0.20	05/12/09 13:10	

LABORATORY CONTROL SAMPLE: 480997

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.7	94	90-110	
Fluoride	mg/L	5	4.8	96	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 480998 480999

Parameter	Units	6058283001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	5.0	5	5	9.6	9.6	91	92	60-125	0	5	
Fluoride	mg/L	ND	5	5	4.8	4.8	92	93	80-116	1	7	

MATRIX SPIKE SAMPLE: 481000

Parameter	Units	6058211002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	7.8	5	12.3	91	60-125	
Fluoride	mg/L	0.44	5	5.0	92	80-116	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: AQC Lower Pond
Pace Project No.: 6058151

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

Pace Analytical is NELAP accredited. Contact your Pace PM for the current list of accredited analytes.

U - Indicates the compound was analyzed for, but not detected.

PaceAnalytical®
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request D ument

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

1306667

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: KCP&L	Report To:	Attention:
Address: E 2200 Rd	Copy To:	Company Name:
La Cygne, KS		Address:
Email To: Theresa Gorn / Andy S	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☑ OTHER ______

Site Location STATE: ______

Requested Analysis Filtered (Y/N)

605815/

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Matrix Codes MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	TIME	COMPOSITE END/GRAB DATE	TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	↓Analysis Test↓ Y/N	Fluoride	Chloride	Sulfide	Mercury		Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	AQC lower pond	WT		5/4/09	0945				1	1													OTHR BP34 BP3	N 1.5	BP32 16 001
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
10K 4 ad'nl days	Andy Stimaitis	5/4/09	11:19	[signature]	5/4	1119	17.1	N	Y	Y
While discharging										
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

ORIGINAL

SAMPLER NAME AND SIGNATURE	
PRINT Name of SAMPLER: Bill Porter	
SIGNATURE of SAMPLER:	DATE Signed (MM/DD/YY):

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Sample Condition Upon Receipt

Pace Analytical® www.pacelabs.com

Client Name: KCP&L

Project # 605851

5114

[redacted]

AQC Lower Pad

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace Other ______

Tracking #: ______

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☑ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☑ None ☐ Other ______

Thermometer Used T-189 T-142

Type of Ice: Wet Blue None

☐ Samples on ice, cooling process has begun

Cooler Temperature 17.1

Temp should be above freezing to 6°C

Biological Tissue is Frozen: Yes No

Date and Initials of person examining contents: BW 5/4

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☐Yes ☑No ☐N/A	9.
-Pace Containers Used:	☐Yes ☑No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☑No ☐N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: WT		
All containers needing preservation have been checked.	☑Yes ☐No ☐N/A	13. VOL RCV'D IN 1 LARGE UNPRESERVED CONTAINER POURED OFF VOL INTO PREPRESERVED HNO3 CONT AND NAOH & ZN CONT
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☑No	Initial when completed BW; Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☑No ☐N/A	16.
Trip Blank Custody Seals Present	☐Yes ☑No ☐N/A	
Pace Trip Blank Lot # (if purchased): ______		

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: ______ Date/Time: ______

Comments/ Resolution: ______

Project Manager Review: ACC for CLG **Date:** 05/04/09

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

May 18, 2009

Ms. Theresa Goin
KCPL Lacygne Station
25166 E. 2200 Rd.
Lacygne, KS 66040

RE: Project: WATER 5/4-5/6
Pace Project No.: 6058262

Dear Ms. Goin:
Enclosed are the analytical results for sample(s) received by the laboratory on May 06, 2009. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Connie L Gardner

Connie Gardner

connie.gardner@pacelabs.com
Project Manager

Enclosures

cc: Bob Beck, KCPL Lacygne Station
Andrew Stimatze, KCPL Lacygne Station

Pace Analytical
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project:	WATER 5/4-5/6
Pace Project No.:	6058262

Kansas Certification IDs

Utah Certification #: 9135995665
Texas Certification #: T104704407-08-TX
Oklahoma Certification #: 9205/9935
Nevada Certification #: KS000212008A
Louisiana Certification #: 03055
Kansas/NELAP Certification #: E-10116
Iowa Certification #: 118
Illinois Certification #: 001191
Arkansas Certification #: 05-008-0
A2LA Certification #: 2456.01

Pace Analytical
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: WATER 5/4-5/6
Pace Project No.: 6058262

Lab ID	Sample ID	Matrix	Date Collected	Date Received
6058262001	**001**	Water	05/05/09 09:54	05/06/09 13:55
6058262002	**002**	Water	05/05/09 09:40	05/06/09 13:55
6058262003	**003**	Water	05/05/09 09:00	05/06/09 13:55
6058262004	**004**	Water	05/05/09 09:47	05/06/09 13:55
6058262005	**005**	Water	05/05/09 10:00	05/06/09 13:55
6058262006	**007**	Water	05/05/09 10:04	05/06/09 13:55
6058262007	**008**	Water	05/05/09 10:10	05/06/09 13:55
6058262008	**013**	Water	05/05/09 10:45	05/06/09 13:55
6058262009	**AQC LOWER POND**	Water	05/05/09 09:20	05/06/09 13:55
6058262010	**AQC LOWER POND**	Water	05/06/09 10:00	05/06/09 13:55

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: WATER 5/4-5/6
Pace Project No.: 6058262

Lab ID	Sample ID	Method	Analysts	Analytes Reported
6058262001	**001**	EPA 1664A	MRT	1
		SM 2540D	SAH	1
6058262002	**002**	EPA 1664A	MRT	1
		SM 2540D	SAH	1
6058262003	**003**	SM 2540D	SAH	1
6058262004	**004**	SM 2540D	SAH	1
6058262005	**005**	EPA 1664A	MRT	1
		SM 2540D	SAH	1
6058262006	**007**	EPA 1664A	MRT	1
		SM 2540D	SAH	1
6058262007	**008**	EPA 1664A	MRT	1
		SM 2540D	SAH	1
6058262008	**013**	SM 2540D	SAH	1
6058262009	**AQC LOWER POND**	EPA 300.0	RAB	2
		EPA 7470	SMW	1
		SM 2540D	SAH	1
		SM 4500-S-2 F	KPZ	1
6058262010	**AQC LOWER POND**	EPA 300.0	RAB	2
		EPA 7470	SMW	1
		SM 2540D	SAH	1
		SM 4500-S-2 F	KPZ	1

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: WATER 5/4-5/6
Pace Project No.: 6058262

Sample: AQC LOWER POND | **Lab ID: 6058262009** | Collected: 05/05/09 09:20 | Received: 05/06/09 13:55 | Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470							
Mercury	ND	ug/L	0.20	1	05/07/09 11:47	05/07/09 16:57	7439-97-6	
2540D Total Suspended Solids	Analytical Method: SM 2540D							
Total Suspended Solids	**28.0**	mg/L	5.0	1		05/08/09 10:02		
4500S2F Sulfide, Iodometric	Analytical Method: SM 4500-S-2 F							
Sulfide	ND	mg/L	0.50	1		05/11/09 16:15		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**711**	mg/L	50.0	50		05/13/09 11:17	16887-00-6	
Fluoride	**10.9**	mg/L	0.40	2		05/13/09 14:43	16984-48-8	

Pace Analytical
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: WATER 5/4-5/6
Pace Project No.: 6058262

Sample: AQC LOWER POND **Lab ID: 6058262010** Collected: 05/06/09 10:00 Received: 05/06/09 13:55 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470							
Mercury	ND	ug/L	0.20	1	05/07/09 11:47	05/07/09 16:59	7439-97-6	
2540D Total Suspended Solids	Analytical Method: SM 2540D							
Total Suspended Solids	**34.0**	mg/L	5.0	1		05/11/09 11:28		
4500S2F Sulfide, Iodometric	Analytical Method: SM 4500-S-2 F							
Sulfide	ND	mg/L	0.50	1		05/11/09 16:15		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**702**	mg/L	50.0	50		05/13/09 11:49	16887-00-6	
Fluoride	**11.0**	mg/L	0.40	2		05/13/09 14:59	16984-48-8	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: WATER 5/4-5/6
Pace Project No.: 6058262

QC Batch: MERP/3501 Analysis Method: EPA 7470
QC Batch Method: EPA 7470 Analysis Description: 7470 Mercury
Associated Lab Samples: 6058262009, 6058262010

METHOD BLANK: 479174 Matrix: Water
Associated Lab Samples: 6058262009, 6058262010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	ND	0.20	05/07/09 16:33	

LABORATORY CONTROL SAMPLE: 479175

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	5.0	100	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 479176 479177

Parameter	Units	6057955020 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	0.33	5	5	5.1	5.1	95	95	75-125	0	10	

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: WATER 5/4-5/6
Pace Project No.: 6058262

QC Batch: WET/17480 Analysis Method: SM 2540D
QC Batch Method: SM 2540D Analysis Description: 2540D Total Suspended Solids
Associated Lab Samples: 6058262007, 6058262008, 6058262009

METHOD BLANK: 479568 Matrix: Water
Associated Lab Samples: 6058262007, 6058262008, 6058262009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	5.0	05/08/09 10:00	

SAMPLE DUPLICATE: 479569

Parameter	Units	6058262007 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	ND	5.0		17	

SAMPLE DUPLICATE: 479570

Parameter	Units	6058262008 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	ND	ND		17	

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: WATER 5/4-5/6
Pace Project No.: 6058262

QC Batch: WET/17506
QC Batch Method: SM 2540D
Associated Lab Samples: 6058262010

Analysis Method: SM 2540D
Analysis Description: 2540D Total Suspended Solids

METHOD BLANK: 480488
Matrix: Water
Associated Lab Samples: 6058262010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	5.0	05/11/09 11:24	

SAMPLE DUPLICATE: 480489

Parameter	Units	6058276001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	234	226	3	17	

SAMPLE DUPLICATE: 480490

Parameter	Units	6058288003 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	57.0	56.0	2	17	

Pace Analytical
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: WATER 5/4-5/6
Pace Project No.: 6058262

QC Batch: WET/17514 — Analysis Method: SM 4500-S-2 F
QC Batch Method: SM 4500-S-2 F — Analysis Description: 4500S2F Sulfide, Iodometric
Associated Lab Samples: 6058262009, 6058262010

METHOD BLANK: 480643 — Matrix: Water
Associated Lab Samples: 6058262009, 6058262010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfide	mg/L	ND	0.50	05/11/09 16:15	

LABORATORY CONTROL SAMPLE: 480644

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfide	mg/L	10	10.4	104	80-120	

MATRIX SPIKE SAMPLE: 480645

Parameter	Units	6058263010 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfide	mg/L	ND	20	22.4	112	75-125	

SAMPLE DUPLICATE: 480646

Parameter	Units	6058263009 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfide	mg/L	ND	ND		15	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: WATER 5/4-5/6
Pace Project No.: 6058262

QC Batch: WETA/9839 — Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 — Analysis Description: 300.0 IC Anions
Associated Lab Samples: 6058262009, 6058262010

METHOD BLANK: 481206 — Matrix: Water
Associated Lab Samples: 6058262009, 6058262010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	ND	1.0	05/13/09 01:08	
Fluoride	mg/L	ND	0.20	05/13/09 01:08	

LABORATORY CONTROL SAMPLE: 481207

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.6	93	90-110	
Fluoride	mg/L	5	4.9	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 481208 481209

Parameter	Units	6058223003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	366	500	500	850	869	97	101	60-125	2	5	
Fluoride	mg/L	ND	500	500	493	504	99	101	80-116	2	7	

MATRIX SPIKE SAMPLE: 481210

Parameter	Units	6058241001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	529	250	776	99	60-125	
Fluoride	mg/L	ND	250	235	94	80-116	

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: WATER 5/4-5/6
Pace Project No.: 6058262

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

Pace Analytical is NELAP accredited. Contact your Pace PM for the current list of accredited analytes.

U - Indicates the compound was analyzed for, but not detected.

CHAIN-OF-CUSTODY / Analytical Request Document

Pace Analytical®
www.pacelabs.com

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page:	of
1219034	

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: KCPL	Report To: Andy Stimatze	Attention:
Address: La Cygne, KS	Copy To: Theresa Goin	Company Name:
		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER ________

Site Location STATE: ________

Requested Analysis Filtered (Y/N)

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Matrix Codes MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT

6058262

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	TIME	COMPOSITE END/GRAB DATE	TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH + Zn Acetate	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Oil+Grease	TSS	Chloride	Fluoride	Sulfide	Mercury		Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	001		G	5/5	0954			26	3	1	2								✓	✓					2(BG1S) 1(BP2U)		001
2	002		G	5/5	0940			28	3	1	2								✓	✓					↓		002
3	003		G	5/5	0900			19	1	1										✓					1(BP2U)		003
4	004		G	5/5	0947			19	1	1										✓					↓		004
5	005		G	5/5	1000			34	3	1	2								✓	✓					2(BG1S) 1(BP2U)		005
6	007		G	5/5	1004			21	3	1	2								✓	✓							006
7	008		G	5/5	1010			26	3	1	2								✓	✓					↓		007
8	013		G	5/5	1045			13	1	1										✓					1(BP2U)		008
9	AQC Lower Pond		G	5/4	0945			18	3	1		1		1						✓	✓	✓	✓	✓			NO Sample Rec'd
10	AQC Lower Pond		G	5/5	0920			19	3	1		1		1						✓	✓	✓	✓	✓	1(BP2U) 1(BP3N) 1(BP3Z)[1.5] 1(BP3N)[1.5]		009
11	AQC Lower Pond		G	5/6	1000			19	3	1		1		1						✓	✓	✓	✓	✓	1(BP3U) 1(BP3Z)[1.5] 1(BP3N)[1.5]		010
12																											

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Jim Mansfield / KCPL	05/06/09	1355	[illegible signature]	5/6/09	13:55	4.1 / 5.5	Y	N	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY):

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Sample Condition Upon Receipt

Pace Analytical® www.pacelabs.com

Client Name: KCPL **Project #** 6058262

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☒ Client ☐ Commercial ☐ Pace Other ______ [redacted] 5/18

Tracking #: ______

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☒ no

Packing Material: ☒ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other ______ Water sheets

Thermometer Used T-189 T-142 **Type of Ice:** Wet Blue None ☐ Samples on ice, cooling process has begun

Cooler Temperature 4.1, 5.5 **Biological Tissue is Frozen:** Yes No

Temp should be above freezing to 6°C

Date and initials of person examining contents: JWS 5/6/09 1430

				Comments:
Chain of Custody Present:	☒ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out:	☒ Yes	☐ No	☐ N/A	2.
Chain of Custody Relinquished:	☒ Yes	☐ No	☐ N/A	3.
Sampler Name & Signature on COC:	☒ Yes	☐ No	☐ N/A	4.
Samples Arrived within Hold Time:	☒ Yes	☐ No	☐ N/A	5.
Short Hold Time Analysis (<72hr):	☐ Yes	☒ No	☐ N/A	6.
Rush Turn Around Time Requested:	☐ Yes	☒ No	☐ N/A	7.
Sufficient Volume:	☒ Yes	☐ No	☐ N/A	8.
Correct Containers Used:	☒ Yes	☐ No	☐ N/A	9. one BP2U has AQC Pond on the
-Pace Containers Used:	☒ Yes	☐ No	☐ N/A	Side of bottle but 13 on the label.
Containers Intact:	☒ Yes	☐ No	☐ N/A	10. one BP2U has 013 on lid no other ID.
Filtered volume received for Dissolved tests	☐ Yes	☐ No	☒ N/A	11.
Sample Labels match COC:	☒ Yes	☐ No	☐ N/A	12. AQC Lower Pond no samples w/ date 5/4/09
-Includes date/time/ID/Analysis Matrix: water				
All containers needing preservation have been checked.	☐ Yes	☐ No	☒ N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐ Yes	☐ No	☒ N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☒ Yes	☐ No		Initial when completed NA / Lot # of added preservative
Samples checked for dechlorination:	☐ Yes	☐ No	☒ N/A	14.
Headspace in VOA Vials (>6mm):	☐ Yes	☐ No	☒ N/A	15.
Trip Blank Present:	☐ Yes	☐ No	☒ N/A	16.
Trip Blank Custody Seals Present	☐ Yes	☐ No	☒ N/A	
Pace Trip Blank Lot # (if purchased): NA				

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: Andy Stuncee Date/Time: 5/6/09

Comments/ Resolution: Bottle w/ 2 ID's is AQC Pond - collected extra for TSS. No Samples sent for AQC Lower Pond for 5/4/09. Already Rcvd earlier this week. CB

Project Manager Review: CB 5/7/09 **Date:** ______

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

F-KS-C-003-Rev.04, 04February2009

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

May 29, 2009

Ms. Theresa Goin
KCPL Lacygne Station
25166 E. 2200 Rd.
Lacygne, KS 66040

RE: Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

Dear Ms. Goin:

Enclosed are the analytical results for sample(s) received by the laboratory on May 16, 2009. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Anna Custer for
Connie Gardner
connie.gardner@pacelabs.com
Project Manager

Enclosures

cc: Bob Beck, KCPL Lacygne Station
Andrew Stimatze, KCPL Lacygne Station

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project:	LOWER POND - 5/12-15/09
Pace Project No.:	6058880

Kansas Certification IDs

Washington Certification #: C2069
Utah Certification #: 9135995665
Texas Certification #: T104704407-08-TX
Oklahoma Certification #: 9205/9935
Nevada Certification #: KS000212008A
Louisiana Certification #: 03055
Kansas/NELAP Certification #: E-10116
Iowa Certification #: 118
Illinois Certification #: 001191
Arkansas Certification #: 05-008-0
A2LA Certification #: 2456.01

Pace Analytical
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

Lab ID	Sample ID	Matrix	Date Collected	Date Received
6058880001	**LOWER POND**	Water	05/12/09 10:10	05/16/09 00:10
6058880002	**LOWER POND**	Water	05/13/09 08:15	05/16/09 00:10
6058880003	**LOWER POND**	Water	05/14/09 09:20	05/16/09 00:10
6058880004	**LOWER POND**	Water	05/15/09 10:40	05/16/09 00:10

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

Lab ID	Sample ID	Method	Analysts	Analytes Reported
6058880001	**LOWER POND**	EPA 300.0	MRT	3
		EPA 7470	JDH	1
		SM 2540D	HMW	1
6058880002	**LOWER POND**	EPA 300.0	MRT	3
		EPA 7470	JDH	1
		SM 2540D	HMW	1
6058880003	**LOWER POND**	EPA 300.0	MRT	3
		EPA 7470	JDH	1
		SM 2540D	HMW	1
6058880004	**LOWER POND**	EPA 300.0	MRT	3
		EPA 7470	JDH	1
		SM 2540D	HMW	1

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

Sample: LOWER POND **Lab ID: 6058880001** Collected: 05/12/09 10:10 Received: 05/16/09 00:10 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470							
Mercury	ND	ug/L	0.20	1	05/22/09 12:15	05/22/09 16:32	7439-97-6	
2540D Total Suspended Solids	Analytical Method: SM 2540D							
Total Suspended Solids	**60.0**	mg/L	5.0	1		05/19/09 10:31		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**601**	mg/L	100	100		05/26/09 22:16	16887-00-6	
Fluoride	**11.7**	mg/L	2.0	10		05/26/09 21:58	16984-48-8	
Sulfate	**2300**	mg/L	200	200		05/28/09 04:25	14808-79-8	

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

Sample: LOWER POND **Lab ID: 6058880002** Collected: 05/13/09 08:15 Received: 05/16/09 00:10 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470							
Mercury	ND	ug/L	0.20	1	05/22/09 12:15	05/22/09 16:33	7439-97-6	
2540D Total Suspended Solids	Analytical Method: SM 2540D							
Total Suspended Solids	**60.0**	mg/L	5.0	1		05/19/09 10:46		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**586**	mg/L	100	100		05/26/09 22:53	16887-00-6	
Fluoride	**11.5**	mg/L	2.0	10		05/26/09 22:35	16984-48-8	
Sulfate	**2260**	mg/L	200	200		05/28/09 04:43	14808-79-8	

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

Sample: LOWER POND **Lab ID: 6058880003** Collected: 05/14/09 09:20 Received: 05/16/09 00:10 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470							
Mercury	ND	ug/L	0.20	1	05/22/09 12:15	05/22/09 16:35	7439-97-6	
2540D Total Suspended Solids	Analytical Method: SM 2540D							
Total Suspended Solids	**56.0**	mg/L	5.0	1		05/21/09 14:17		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**587**	mg/L	100	100		05/27/09 00:07	16887-00-6	
Fluoride	**11.4**	mg/L	2.0	10		05/26/09 23:12	16984-48-8	
Sulfate	**2330**	mg/L	200	200		05/28/09 05:02	14808-79-8	

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

Sample: LOWER POND **Lab ID: 6058880004** Collected: 05/15/09 10:40 Received: 05/16/09 00:10 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470							
Mercury	ND	ug/L	0.20	1	05/26/09 16:50	05/27/09 14:01	7439-97-6	
2540D Total Suspended Solids	Analytical Method: SM 2540D							
Total Suspended Solids	**119**	mg/L	5.0	1		05/22/09 14:04		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**626**	mg/L	100	100		05/27/09 00:44	16887-00-6	
Fluoride	**11.2**	mg/L	2.0	10		05/27/09 00:26	16984-48-8	
Sulfate	**2320**	mg/L	200	200		05/28/09 05:57	14808-79-8	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

QC Batch: WET/17632
Analysis Method: SM 2540D
QC Batch Method: SM 2540D
Analysis Description: 2540D Total Suspended Solids
Associated Lab Samples: 6058880001

METHOD BLANK: 484230
Matrix: Water
Associated Lab Samples: 6058880001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	5.0	05/19/09 10:30	

SAMPLE DUPLICATE: 484231

Parameter	Units	6058649001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	50.0	51.0	2	17	

SAMPLE DUPLICATE: 484232

Parameter	Units	6058653003 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	133	127	5	17	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

QC Batch: WET/17634 — Analysis Method: SM 2540D
QC Batch Method: SM 2540D — Analysis Description: 2540D Total Suspended Solids
Associated Lab Samples: 6058880002

METHOD BLANK: 484241 — Matrix: Water
Associated Lab Samples: 6058880002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	5.0	05/19/09 10:40	

SAMPLE DUPLICATE: 484242

Parameter	Units	6058688001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	268	260	3	17	

SAMPLE DUPLICATE: 484243

Parameter	Units	6058698001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	88.0	95.0	8	17	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

QC Batch: WET/17675
QC Batch Method: SM 2540D
Associated Lab Samples: 6058880003

Analysis Method: SM 2540D
Analysis Description: 2540D Total Suspended Solids

METHOD BLANK: 485214
Matrix: Water
Associated Lab Samples: 6058880003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	5.0	05/21/09 13:51	

SAMPLE DUPLICATE: 485215

Parameter	Units	6058833003 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	17.0	17.0	0	17	

SAMPLE DUPLICATE: 485216

Parameter	Units	6058858001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	8.0	9.0	12	17	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

QC Batch: WET/17696
QC Batch Method: SM 2540D
Associated Lab Samples: 6058880004

Analysis Method: SM 2540D
Analysis Description: 2540D Total Suspended Solids

METHOD BLANK: 486055
Matrix: Water
Associated Lab Samples: 6058880004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	5.0	05/22/09 14:04	

SAMPLE DUPLICATE: 486056

Parameter	Units	6058874004 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	20.0	21.0	5	17	

SAMPLE DUPLICATE: 486057

Parameter	Units	6058910005 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	160	163	2	17	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

QC Batch: MERP/3532 Analysis Method: EPA 7470
QC Batch Method: EPA 7470 Analysis Description: 7470 Mercury
Associated Lab Samples: 6058880001, 6058880002, 6058880003

METHOD BLANK: 486096 Matrix: Water
Associated Lab Samples: 6058880001, 6058880002, 6058880003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	ND	0.20	05/22/09 16:19	

LABORATORY CONTROL SAMPLE: 486097

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	4.6	91	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 486098 486099

Parameter	Units	6058880001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	ND	5	5	3.9	3.9	78	77	75-125	0	20	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

QC Batch: MERP/3535 | Analysis Method: EPA 7470
QC Batch Method: EPA 7470 | Analysis Description: 7470 Mercury
Associated Lab Samples: 6058880004

METHOD BLANK: 487526 | Matrix: Water
Associated Lab Samples: 6058880004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	ND	0.20	05/27/09 13:58	

LABORATORY CONTROL SAMPLE: 487527

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	4.7	94	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 487528 487529

Parameter	Units	6058880004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	ND	5	5	3.5	3.5	68	67	75-125	1	20	M0

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

QC Batch: WETA/9980 | Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 | Analysis Description: 300.0 IC Anions
Associated Lab Samples: 6058880001, 6058880002, 6058880003, 6058880004

METHOD BLANK: 487679 | Matrix: Water
Associated Lab Samples: 6058880001, 6058880002, 6058880003, 6058880004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	ND	1.0	05/26/09 19:11	
Fluoride	mg/L	ND	0.20	05/26/09 19:11	

LABORATORY CONTROL SAMPLE: 487680

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.8	97	90-110	
Fluoride	mg/L	5	5.2	103	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 487684 | 487685

Parameter	Units	6058893005 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	71.4	50	50	120	122	97	101	60-125	2	5	
Fluoride	mg/L	ND	50	50	51.8	51.4	101	101	80-116	1	7	

MATRIX SPIKE SAMPLE: 487686

Parameter	Units	6058946004 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	38.6	25	61.2	90	60-125	
Fluoride	mg/L	ND	25	25.3	98	80-116	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: LOWER POND - 5/12-15/09
Pace Project No.: 6058880

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

Pace Analytical is NELAP accredited. Contact your Pace PM for the current list of accredited analytes.

U - Indicates the compound was analyzed for, but not detected.

ANALYTE QUALIFIERS

M0 Matrix spike recovery was outside laboratory control limits.

Pace Analytical®
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

1219089

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	KCPL · La Cygne	Report To:	A E Fowler	Attention:	
Address:	La Cygne KS	Copy To:	T Goin	Company Name:	
				Address:	
Email To:		Purchase Order No.:		Pace Quote Reference:	
Phone:	Fax:	Project Name:		Pace Project Manager:	
Requested Due Date/TAT:		Project Number:		Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER ______

Site Location STATE: ______

Requested Analysis Filtered (Y/N)

Section D Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

2009

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	TSS	Cl	Fl	Hg	SO_4^{-2}		Residual Chlorine (Y/N)	Pace Project No./ Lab I.D. 6058880
1	Lower Pond	W	G	~~5/12~~		5/12	10:10		3	2		/							X	X	X	X	X	BP3N		BP2U BP3U 001
2		W	G			5/13	08:15		3	2		/							X	X	X	X	X			002
3		W	G			5/14	09:20		3	2		/							X	X	X	X	X			003
4		W	G			5/15	10:40		2	1		/							X	X	X	X	X			BP1U 004
5																										
6	Note:																									
7	Samples 5/12 - 5/14																									
8	were sampled																									
9	by: B. PORTER																									
10																										
11																										
12																										

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	M Mickler	5/15/9	1400	Joseph G. Kramer	5-15-2009	1400				
				[signature]	5/16/09	0010	3.1	Y	N	Y
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Michael L. Mickler

SIGNATURE of SAMPLER: Michael L Mickler DATE Signed (MM/DD/YY): 5/15/09

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Sample Condition Upon Receipt

Pace Analytical® www.pacelabs.com

Client Name: KCPL **Project #** 6058880

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☑ Commercial ☐ Pace Other ECI

Tracking #: ____________

Optional
Proj. Due Date: 5/28/09
Proj. Name: Lower Pond

Custody Seal on Cooler/Box Present: ☐ yes ☑ no   Seals intact: ☐ yes ☑ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☑ None ☐ Other ____________

Thermometer Used T-189 T-142 T-191   **Type of Ice:** (Wet) Blue None   ☐ Samples on ice, cooling process has begun

Cooler Temperature 3.1   ~~Biological Tissue is Frozen:~~ Yes No

Temp should be above freezing to 6°C

Date and Initials of person examining contents: 5/16/09 KS

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix: WT	☑Yes ☐No ☐N/A	12.
All containers needing preservation have been checked.	☑Yes ☐No ☐N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☑No	Initial when completed KS; Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased):________		KS

Client Notification/ Resolution: Copy COC to Client? (Y) / N   Field Data Required? Y / N   CB

Person Contacted: ____________ Date/Time: ____________

Comments/ Resolution: ____________

Project Manager Review: CB 5/18/09   **Date:** ____________

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

4/15/09 011 Sample Collection
Reese / Chandel
Time: 0130 Flow 515000 gpm
pH 8.4 Temp: 27.0

This is the 3rd Sample for the 24 hr. Composite.

4/15/09 011 Sample Porter
Time 0850 Temp 27.1 °C
pH 8.54 Total Cl - 0.04

JKM

4/15/09 Miller These sample (4/15) were tested using Hach HQ30d pH meter & Colorimeter II
The pH meter was calibrated 4/15/09

5/4/09 Time 0945 AQC lower pond sampled at overflow.
Flow rate about 2000 gpm
pH 7.79 temp. 18.3
Bill Porter

5/5/09 Porter / Mansfield

outfall	Time	Temp °C	pH	Flow	Total Cl⁻
001	0954	26 ~~8.7~~	8.7	500	—
002	0940	28	7.8	400	—
003	0900	19	7.9	600	—
004	0947	19	8.9	3	—
005	1000	34	7.7	70	—
006	No Flow				
007	1004	21	7.9	30	—
008	1010	26	7.6	20	—
011	1120	27	8.0	250,000	.09
013	1045	13	8.0	—	—
AQC lower	0920	19	7.8	10,000	—

The above samples were tested using Hach HQ30D. Calibrated with 7+10 buffer. Cl⁻ was analysised by Hach II colorimeter.

AQC lower pond sample at 1000 flow rate 4,000 gpm pH 7.8 temp 19°C 5/6/09 Bill Porter

5/7/09 1010 AQC lower pond sample collected pH 7.9 temp 20°C Bill Porter 4,000 gpm

* Entered by Astrometra 5/11/09

5/8/09 * AQC Pond overflow sampled close to weir ~11:00 am. Temp ≅ 20°C pH ≅ 7.9 by Jim Mansfield. Flow = 4000 gpm.

Mihle 5/9/09 Lower ~~A~~ AQC Pond (Clear Water
Sample Time 12:00 pH = 7.9 Temp 21°C
Flow 4,000 gpm – pH + Temp – Hach HQ30d
Cal at 7 & 10

5/10/09 Lower AQC Pond
1115 time 7,9 pH 20°C temp
Flow 3,000 gpm Sampled Bill Porter

5/11/09 Lower AQC Pond
0910 time 7,9 pH 19°C temp
Flow 2,000 gpm Sampled by Bill Porter

5/12/09 Lower AQC Pond
1010 8,0 pH 19°C temp
Flow 1,500 gpm Sampled by Bill Porter

5/13/09 Lower AQC Pond
time 0815 7,9 pH 20°C temp
Flow 1,000 gpm Sample by Bill Porter

5/14/09 Lower AQC pond
time 0930 pH 7.9, temp 20°C
Flow 500 gpm Sampled by Bill Porter

5/15/09 Lower pond - AQC
Time 10:40 pH = 7.9 Temp. = 22°C
Flow 1000 gpm

011 5/20/09 Bill Porter
Total Cl⁻ 0.13 Temp 32.7°C
pH 7.95 flow 525,000 gpm

La Cygne Station
NPDES

For The Week Of Aug 10, 2010 **Date** ______ **Time** ______ **Signature** [signature]

Observations		
Area	**Source/Description**	**Visual Quality**
Sky Condition Clear **Outside Temperature** 90 °F. **Humidity** ____% **Wind from** ____@____ MPH		

		Free of debris and oily sheen (√)	Actions Required (No Action: √) (Maintenance: **MT**)	Comments
NPDES 003	Coal Pile Runoff Ponds	✓		
NPDES 011 (clearwater house)	Discharge Canal	✓		
NPDES 004	Sanitary Stabilization Lagoon	✓		
NPDES 002	Secondary Neutralization Pond	✓		
NPDES 001	Bottom Ash Pond	✓		
NPDES 005	Boiler Area Drains Pond	✓		
NPDES 006	Limestone Hopper Sump Pond	✓		
NPDES 007	Slag Tank Overflow Pond	✓		
NPDES 008	Turbine Area/Car Wash Settling Pond	✓		
NPDES 012	Lake La Cygne Discharge to North Sugar Creek	✓		
Supplemental		**Zero Ø Discharge (√)**		
AQC Pond(s)	Flue Gas Scrubber Wastewater Pond	✓		

URS

Memorandum

Date:	September 14, 2010
To:	Paul Ling – Kansas City Power & Light Mark Adams – Kansas City Power & Light
From:	Brian Linnan, P.E. – URS Corporation
Subject:	Breach Impact Analysis Bottom Ash Pond KCP&L – La Cygne Generating Station

This memorandum contains URS Corporation's evaluation of the potential impact of a breach or failure of the containment for the bottom ash pond shown on Figure 1. The pond is located adjacent to Lake La Cygne, which was constructed to provide water for the power plant. The pond was formed by a combination of excavating and filling; embankment heights are 12 feet or less. The surface area of the pond is approximately 1.7 acres and the total storage capacity of pond is approximately 19,000 cubic yard, or approximately 11.8 acre feet.

Black & Veatch prepared the design plans for Lake La Cygne. Sheet D-202 of the design plans for the dam (copy attached) shows the hydrological information for the dam. The drawing shows that, at the design storm (25.27 inches over 24 hours) the lake reaches a maximum elevation of 847.1 feet at the peak of the hydrograph. The stage-storage curve shows that the lake contains 60,000 acre-feet of water at this elevation. The top of dam elevation is 854 feet, so there is approximately 7 feet of freeboard when the lake is at its maximum elevation.

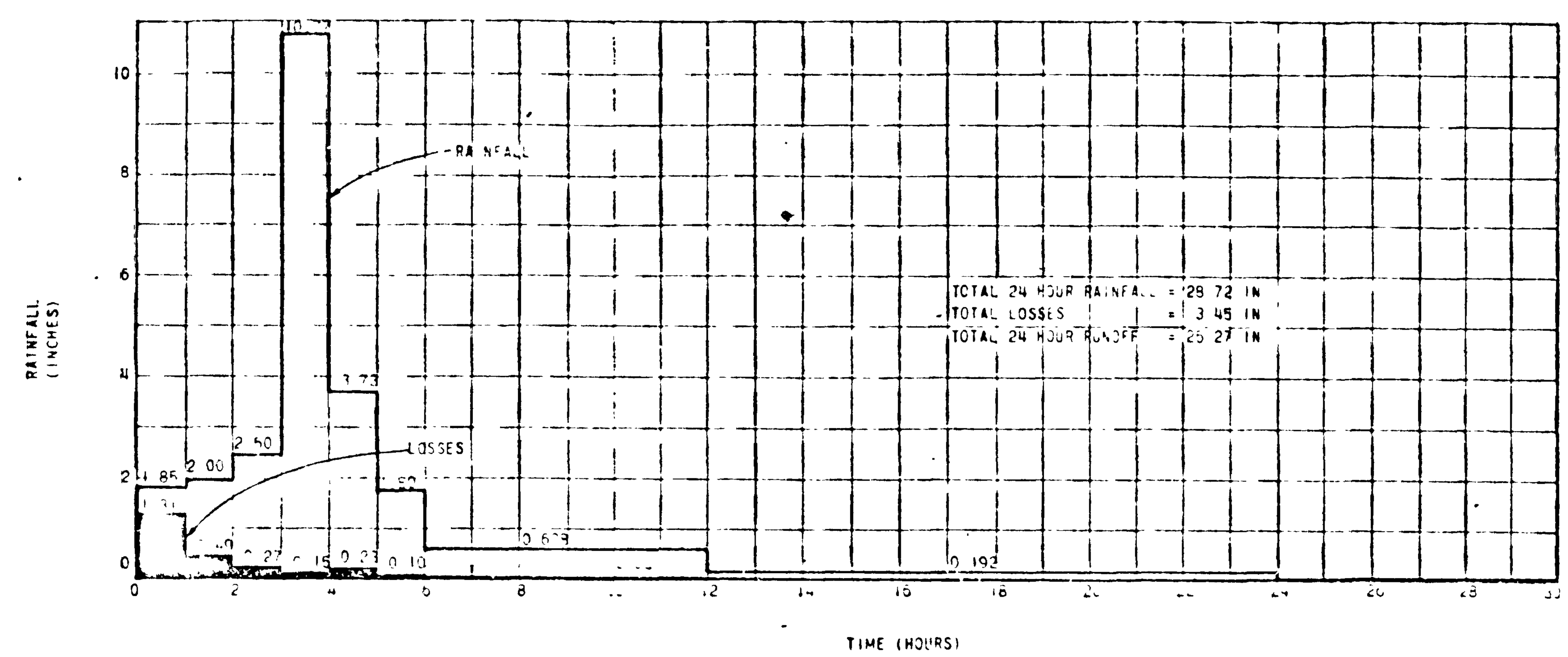
Calculations were made by URS to evaluate the effects of an instantaneous release of the entire storage capacity of the bottom ash pond on the lake level. Since the pond is in close proximity to the lake, a breach would release stored material into the lake causing a rise in the lake level. Of interest is the change in freeboard at the dam at the time of the breach. For the purpose of evaluating the impact of a breach, it was assumed that the bottom ash pond would fail when the lake was at its maximum elevation. Drawing D-202 shows that the surface area of the lake at elevation 847.1 is 3,350 acres. A release of 11.8 acre feet from the bottom ash pond would raise the lake level approximately 0.0035 feet, an imperceptible rise. The freeboard at the dam at the time of the breach would remain approximately 7 feet, so there would be no impact to the stability of the dam or reservoir from the breach. .

Attachments

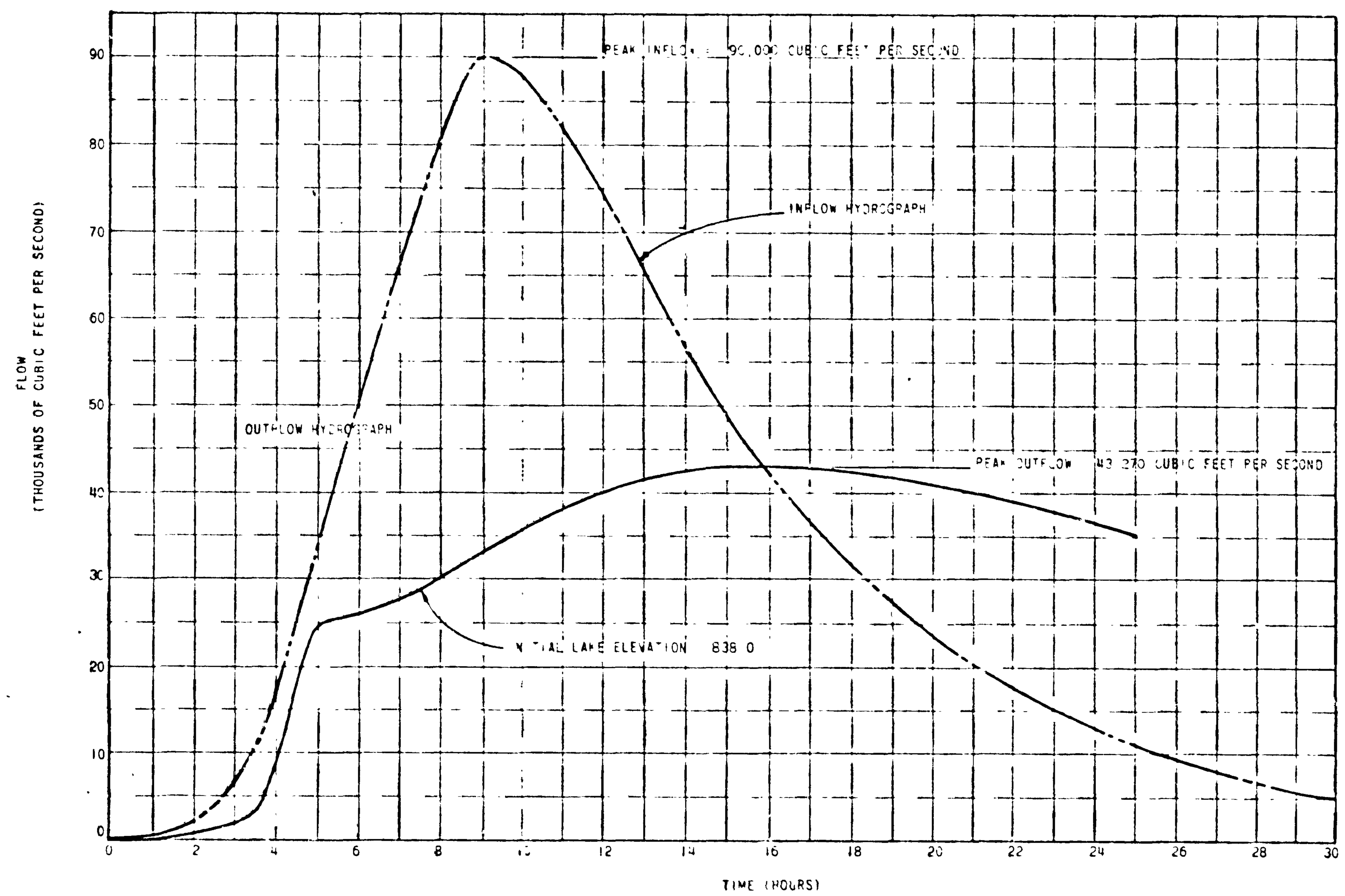
September 17, 2010 10:18:23 am (mik)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Breach Analysis - Aerial View.dwg

URS 8300 College Blvd., Suite 200 Overland Park, Kansas 66210

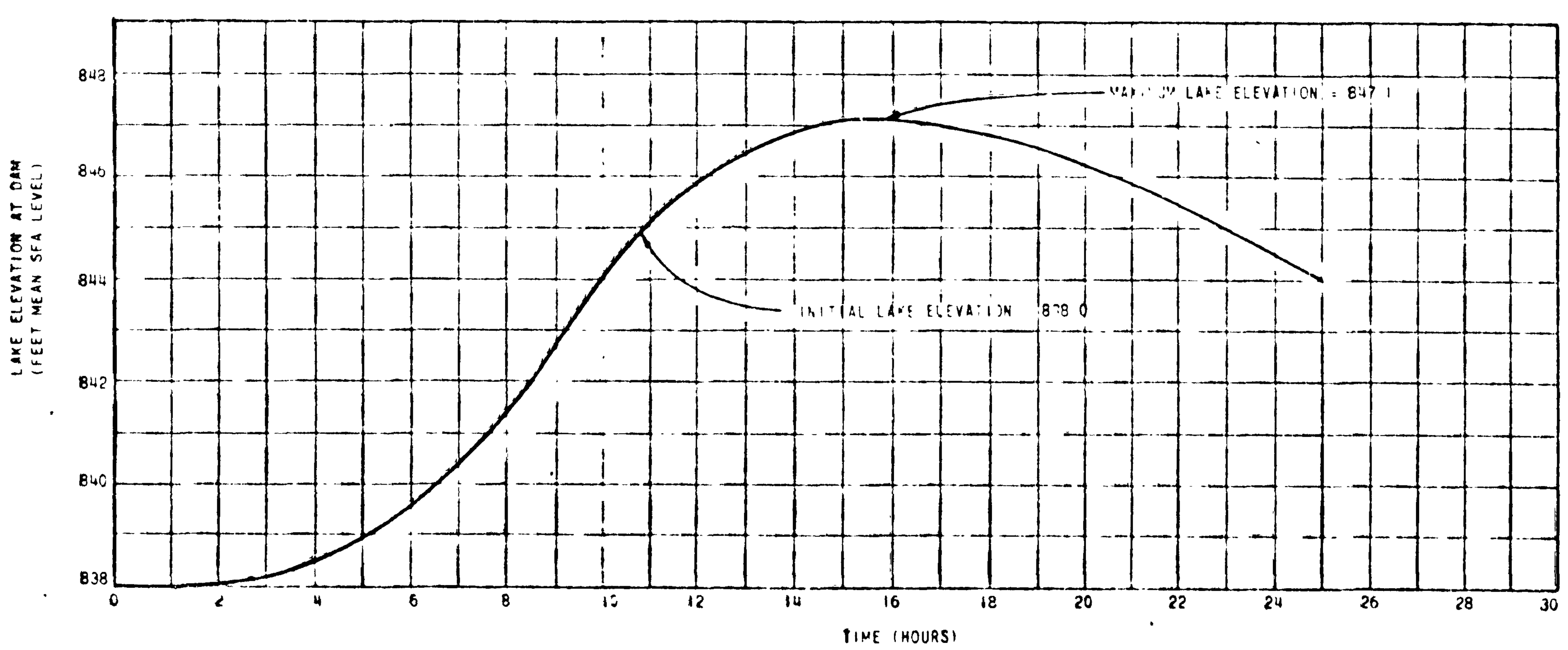
CLIENT: KANSAS CITY POWER & LIGHT COMPANY		
LOCATION: LA CYGNE GENERATING STATION		
TITLE: BOTTOM ASH POND AND LA CYGNE LAKE TOE DAM LOCATION		
DRAWN BY TMS	CHECKED BY WDS	APPROVED BY BDL
PROJECT NO. 16530629	DATE SEPT. 2010	FIGURE NO. 1



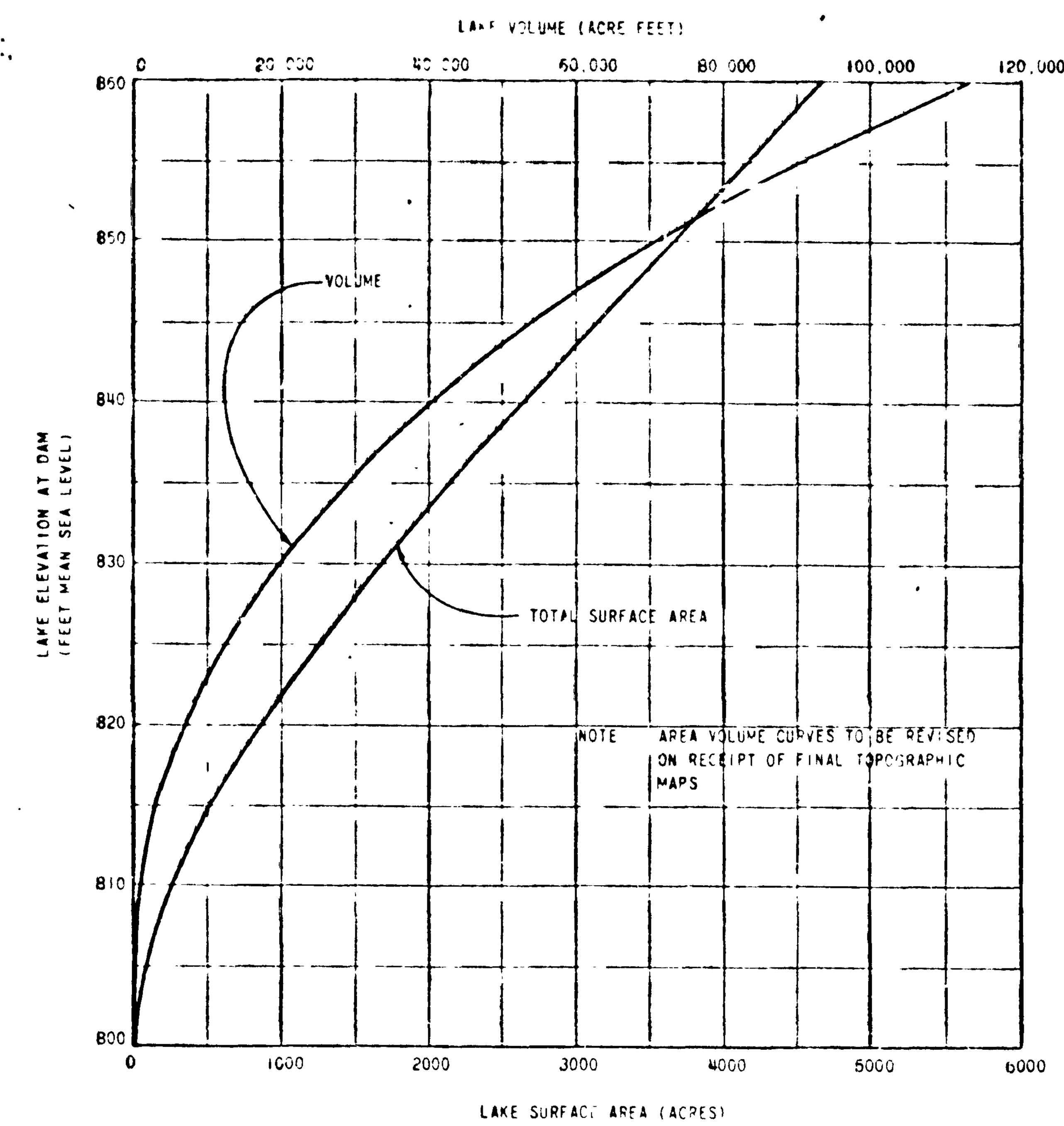
RAINFALL DISTRIBUTION AND LOSSES
SPILLWAY DESIGN STORM



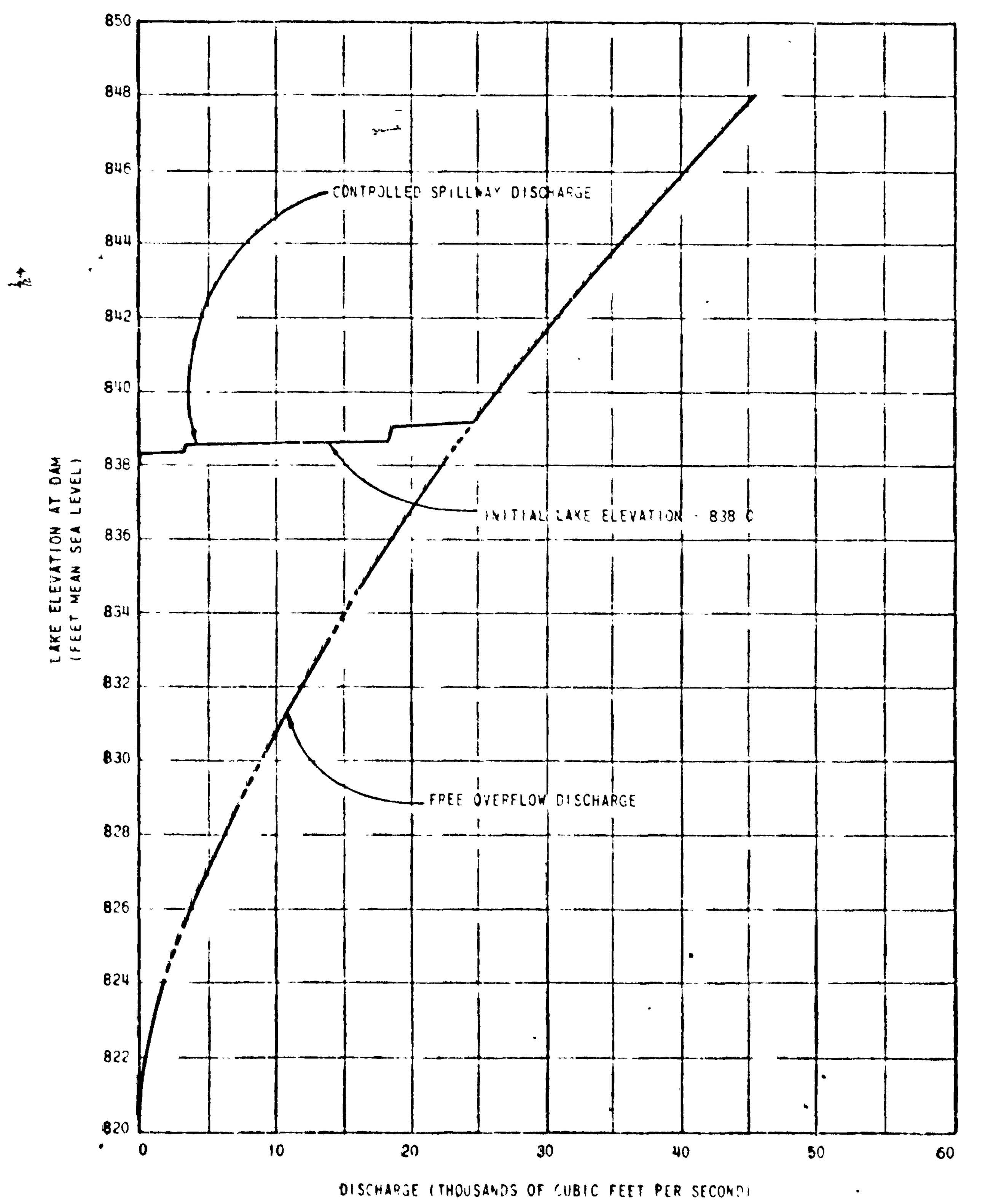
INFLOW AND OUTFLOW HYDROGRAPHS
SPILLWAY DESIGN FLOOD



LAKE ELEVATION AT DAM DURING
SPILLWAY DESIGN FLOOD



LAKE AREA-VOLUME CURVES



SPILLWAY CAPACITY CURVES
CONTROLLED DISCHARGE AND FREE OVERFLOW

PERTINENT DATA
LACYGNE LAKE

GENERAL:

PROJECT LOCATION: 65 MILES SOUTH OF KANSAS CITY IN MIAMI COUNTY AND LINN COUNTY, KANSAS

DAM LOCATION: SIX MILES EAST OF LA CYGNE, KANSAS, ON NORTH SUGAR CREEK (SECTIONS 4 AND 5, T20S, R25E) 10.5 STREAM MILES NORTHEAST OF THE CONFLUENCE WITH THE MARAIS DES CYGNES RIVER

DRAINAGE AREA: 57.5 SQUARE MILES

DAM

TYPE: ZONED EARTHFILL WITH CLAY CORE LENGTH (FT)	6970
MAXIMUM HEIGHT ABOVE STREAMBED (FT)	60
TOP WIDTH (FT)	36
TOP ELEVATION WITHOUT CAMBER ALLOWANCE (FT, MSL)	854
FREEBOARD (FT)	7
SLOPES	
UPSTREAM	2:1 AND 3:1
DOWNSTREAM	3:1

LAKE

MINIMUM OPERATING LAKE LEVEL = 831.0 FT., MSL	
SURFACE AREA (ACRES)	1,750
VOLUME (ACRE-FT.)	21,000
NORMAL OPERATING LAKE LEVEL = 838.0 TO 840.0 FT. MSL	
LAKE LEVEL = 838.0 FT. MSL	
SURFACE AREA (ACRES)	2,420
VOLUME (ACRE-FT.)	36,000
LAKE LEVEL = 840.0 FT. MSL	
SURFACE AREA (ACRES)	2,600
VOLUME (ACRE-FT.)	40,000
MAXIMUM OPERATING LAKE LEVEL AT DAM = 847 FT. MSL	
SURFACE AREA (ACRES)	3,350
VOLUME (ACRE-FT.)	60,000
SEDIMENT RESERVE (ACRE FT.)	500

SPILLWAY

TYPE: RADIAL GATE CONTROLLED CONCRETE OGEE WITH HYDRAULIC JUMP STILLING BASIN	
DESIGN FLOOD	
PEAK INFLOW (CFS)	90,000
VOLUME (ACRE FT.)	92,000
TOTAL RAINFALL (INCHES PER 24 HOURS)	28.72
GROSS CREST LENGTH (FT)	95
NET CREST LENGTH (FT)	88
CREST ELEVATION (FT, MSL)	820.5
DISCHARGE CAPACITY AT MAXIMUM LAKE LEVEL (CFS)	43,270
RADIAL GATES	
NUMBER	2
SIZE (WIDTH x HEIGHT) (FT)	44x23
TOP ELEVATION OF GATE (FT, MSL)	842.0
WITH 9'-5" CUTOUT AT EL. 840.0 FT. MSL (ONE GATE ONLY)	

GENERAL NOTES

DWG. NO. | REFERENCE DRAWINGS

THIS IS A REPRODUCED DRAWING
(ONE-HALF ORIGINAL SIZE)

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP
5 14 69	ISSUED FOR BIDS				
5 2 69	ISSUED FOR APPROVAL OF KWEB				

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE LAKE

DAM
HYDROLOGIC DATA

APPROVED FOR CONSTRUCTION	DEPT HEAD	DES ENGR	CHECKED	DRAWN	PROJ NO.
BY ______ DATE ______	CLM	DJW		JMS	4993

BLACK & VEATCH
CONSULTING ENGINEERS — KANSAS CITY, MISSOURI

DRAWING NO. D-202

NOTICE OF COMPLIANCE/NON-COMPLIANCE

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Division of Environment
Waste Management Program

Initial Inspection: Yes No   Follow-up Inspection: Yes No   Complaint: Yes No
Hazardous Waste: LDF ( ) TSF ( ) GEN ( ) KG ( ) SQ ( ) UNV ( ) NOT A GEN ( ) OTHER ( ) ______________
Used Oil: UOG ( ) UOT ( ) UOM ( ) UOP ( ) UOB ( )
Solid Waste: SLF ( ) TRS ( ) CDL ( ) ILF (X) YWC ( ) SWP ( ) HHW ( ) OBS ( ) MTP ( ) WTM ( ) WTP ( ) WTR ( ) WTT ( )

TO: KCPL   7 / 13 / 10
Facility Name   Date

25166 East 2200 Road   LaCygne   KS   66040   Linn
Address   City   State   Zip Code   County

EPA Identification No.: ____________

Solid Waste Permit No.: 0337

This inspection was conducted to determine compliance with the state and federal solid and/or hazardous waste statutes and regulations.

☐ Violations As Follows   ☒ No Violations Identified

Citation	Description of Violation

☐ Other Comments/Concerns:

This notice is provided to call immediate attention to those areas of non-compliance. This notice does not constitute a compliance order issued by KDHE and may not be a complete listing of all violations which may be identified as a result of this inspection. Your facility must submit in writing within __________ days of receipt of this notice a description of all corrective actions taken. Any corrective actions taken by your facility will be considered in subsequent enforcement follow-up.

Your response must be submitted to:

Kansas Department of Health and Environment
Southeast District Office
Waste Management Program
1500 W. 7th
Chanute, Kansas 66720-9701

If you have any questions concerning this Notice or wish to discuss your response, you may call me at (620) 431-2390 or Bureau of Waste Management in the Topeka office at (785) 296-1600.

This Notice was prepared by: Wesley A. Page

Date 7 / 13 / 10

I, the undersigned hereby acknowledge that I have received and read this Notice.

Printed Name: Theresa Goin

Signature: T. Goin

Title: ECA

Date 7 / 13 / 10

COPIES: White-Facility; Yellow-Bureau of Waste Management; Blue-District

08-015 21.2A.1

SCANNED
MD

K A N S A S

RODERICK L. BREMBY, SECRETARY

KATHLEEN SEBELIUS, GOVERNOR

DEPARTMENT OF HEALTH AND ENVIRONMENT

October 27, 2004

Kansas City Power & Light Company
Route 1, 25166 E 2200 Road
LaCygne, KS 66040

RE: Kansas Water Pollution Control
Permit No. I-MC18-PO01
LaCygne Generating Station

Dear Permittee:

You have fulfilled all the filing requirements for a Kansas Water Pollution Control Permit and Authorization to Discharge under the National Pollutant Discharge Elimination System (NPDES). We are pleased to forward your new permit. While it is permissible to make as many copies as needed for monitoring and reporting purposes, you need to retain the original permit for your files.

We suggest you carefully read the terms and conditions of your permit and understand these terms and conditions are enforceable under both State and Federal law.

Please notice the reporting paragraph on page 2 of your permit, where all reports are due by the 28th day of the scheduled noted. Please submit reports to the, Kansas Department of Health and Environment, Bureau of Water-TSS, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1367.

If you have any questions concerning this permit, contact Ed Dillingham at (785) 296-5513.

Sincerely,

Karl W. Mueldener

Karl Mueldener, P.E.
Director, Bureau of Water

pc: SE - District Office
OA - Permit File

Kansas Permit No.: I-MC18-PO01

Federal Permit No.: KS0080071

KANSAS WATER POLLUTION CONTROL PERMIT AND AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

Pursuant to the Provisions of Kansas Statutes Annotated 65-164 and 65-165, the Federal Water Pollution Control Act as amended, (33 U.S.C. 1251 et seq; the "Act"),

Owner:	Kansas City Power & Light Company
Owner's Address:	Route 1, 25166E 2200 Road La Cygne, KS 66040
Facility Name:	La Cygne Generating Station
Facility Location:	SE ¼ Section 33, Township 19S, Range 25E, Linn County, Kansas
Receiving Stream & Basin:	North Sugar Creek via Lake La Cygne Marais des Cygnes River Basin

is authorized to discharge from the wastewater treatment facility described herein, in accordance with effluent limitations and monitoring requirements as set forth herein.

This permit shall become effective November 1, 2004 will supersede all previous wastewater permits and/or agreements in effect for the facility described herein between the Kansas Department of Health and Environment and the permittee, and will expire October 31, 2009.

FACILITY DESCRIPTION

This facility generates electric power with the high pressure steam produced by fossil fuel combustion. Flue gas scrubber wastewater is directed to the non-discharging 534-acre air quality control pond. All other process wastewater, domestic wastewater and cooling water discharge to Lake La Cygne.

001 - Bottom ash transport water from unit #2 is treated in a settling pond prior to discharging into the discharge canal; approximately 12 mgd.

Secretary, Kansas Department of Health and Environment

October 26, 2004

Date

FACILITY DESCRIPTION: Continued

002 - The secondary neutralization pond receives wastewater from the unit #2 boiler area, unit #1 R.O. reject, primary acid neutralization pond, and sanitary waste stabilization pond effluent. Treatment: sedimentation and neutralization; Average flow 120,000 gpd.
003 - Runoff from coal pile runoff ponds, coal dumper building and crusher building wash down. Sedimentation occurs in the coal pile ponds prior to discharge to Lake La Cygne.
004 - The two-cell sanitary waste stabilization lagoon discharge (9000 gpd) through secondary neutralization pond to 002
005 - The boiler side plant and yard drains pond includes unit #2 boiler blowdown, unit #2 R.O. reject, unit #2 fan and pulverizer area drains, units #1 & #2 plant drains, and U2 boiler drains. Treatment: sedimentation; average discharge to Lake La Cygne 155,000 gpd.
006 - The limestone hopper sump pond discharge (average 50,000 gpd) to Lake La Cygne.
007 - The slag tank overflow pond including: unit #1 boiler area drains, unit #1 bottom ash transport overflow, unit #2 pretreatment system blow-off, and #1 neutralization basin to Lake La Cygne; average discharge 0.405 mgd.
008 - Units #1 and #2 turbine area drains and car wash through settling pond; average discharge to Lake La Cygne 0.08 mgd.
011 - The discharge canal receives 1,100 mgd of plant cooling water and the discharge from outfalls 001 and 002. The canal leads to Lake La Cygne.
012 - Lake La Cygne discharge to North Sugar Creek through dam. (An alternative location for this sampling is the outfall 013 service water intake monitoring location - See footnote 3).
013 - Service water intake monitoring location at a sampling valve in the chemical feed building prior to to the chemical feed eductor.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfalls with serial numbers as specified in this permit. The effluent limitations shall become effective on the dates specified herein. Such discharges shall be controlled, limited and monitored by the permittee as specified. There shall be no discharge of floating solids or visible foam in other than trace amounts.

Monitoring reports shall be submitted monthly on or before the 28th day of the following month. In the event no discharge occurs, written notification is still required.

Effective Date Outfall Number and Effluent Parameter(s) Units		EFFLUENT LIMITATIONS Final Upon Issuance Daily Average	 Daily Maximum	MONITORING REQUIREMENTS Measurement Frequency	 Sample Type
Outfall 001 - Bottom Ash Pond, [1] Outfall 002 - Secondary Neutralizing Pond, [1] Outfall 005 - Boiler Area Drains, Outfall 006 - Limestone Hopper Sump, Outfall 007 - Slag Tank Overflow, [1] and Outfall 008 - Turbine Area Drains [1]					
Flow - gpd			Monitor	Monthly	Estimate
Oil and Grease - mg/l		10	15	Monthly	Grab
Total Suspended Solids [1] - mg/l		30	100	Monthly	Grab
pH - Standard Units	within the range	6.0 and	9.0	Monthly	Grab

A. **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS** (continued)

Effective Date Outfall Number and Effluent Parameter(s) Units		EFFLUENT LIMITATIONS Final Upon Issuance Daily Average	Daily Maximum	MONITORING REQUIREMENTS Measurement Frequency	Sample Type
Outfall 003 - Coal Pile Runoff Ponds Overflow					
Flow - gpd			Monitor	Monthly	Estimate
Total Suspended Solids - mg/l			50	Monthly	Grab
pH - Standard Units	within the range	6.0 and	9.0	Monthly	Grab
Outfall 004 - Main Plant Sanitary Waste Stabilization Lagoon					
Flow - MGD			Monitor	Monthly	Estimate
Biochemical Oxygen Demand (5 Day) - mg/l		30	45	Quarterly	Grab
Total Suspended Solids - mg/l		80	120	Quarterly	Grab
Fecal Coliform - col/100 ml			Monitor	Quarterly [2]	Grab
Outfall 011 - Discharge Canal					
Flow - MGD			Monitor	Twice Monthly	Estimate
Total Residual Oxidant - mg/l			0.2	Twice Monthly [4]	Grab
pH - Standard Units	within the range	6.0 and	9.0	Twice Monthly	Grab
Temperature - °F			Monitor	Twice Monthly	Grab
Monitoring Location 012 - Lake La Cygne Discharge to North Sugar Creek [3]					
Flow - MGD			Monitor	Monthly	Estimate
Nitrogen, Total - mg/l			Monitor	Quarterly	Grab
Phosphorus, Total - mg/l			Monitor	Quarterly	Grab
pH - Standard Units	within the range	6.0 and	9.0	Quarterly	Grab
Temperature - °F			Monitor	Monthly	Grab
Monitoring Location 013 - Service Water Intake					
Total Suspended Solids - mg/l			Monitor	Monthly	Grab

1 A Total Suspended Solids (TSS) net allocation for outfalls 001, 002, 007, and 008 may be claimed when the service water intake is sampled concurrently with outfalls. The TSS net allocation is calculated by subtracting the service water intake value(s) from the outfall value(s). The monitoring report shall contain TSS values for the service water intake, outfall and net allocation.

2 After the first two full years of sampling, permittee may request KDHE reduce the monitoring frequency or discontinue the requirement for further monitoring of this parameter.

A. **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS** (continued)

[3] When conditions at the dam create an unsafe condition to collect a sample of the discharge, the facility may collect a sample at the outfall 013 service water intake monitoring location to represent water quality at the dam. Flow monitoring will not be required when the alternative location is used. The permittee must specify in the monthly monitoring report when the alternative location is used.

[4] During continuous chlorination for macroinvertebrate control (see supplemental condition no. 4) total residual oxidant shall be measured daily.

B. STANDARD CONDITIONS

In addition to the specified conditions stated herein, the permittee shall comply with the attached Standard Conditions dated August 1, 1996.

C. SCHEDULE OF COMPLIANCE

None

D. SUPPLEMENTAL CONDITIONS

1. There shall be no discharge of polychlorinated biphenyl compounds.

2. All samples and flow measurements required for permit monitoring shall be taken on the same day except for miscellaneous discharges related to stormwater runoff, oil storage area runoff, etc.

3. Miscellaneous discharges related to runoff are regulated by water quality criteria. Runoff contained in the oil storage dike area(s) shall be visually inspected to determine if removal of oil and grease is necessary prior to discharge.

4. Total residual oxidant may not be discharged from any single generating unit for more than two hours per day unless the discharger demonstrates to KDHE that discharge for more than two hours is required for macroinvertebrate control. Simultaneous multi-unit oxidation is permitted. Multi-unit oxidation must be designated in the monitoring reports. Upon identification of zebra mussel veligers in the intake water or the detection of adult zebra mussels in Lake La Cygne, the permittee, upon notification of KDHE - Bureau of Water, is allowed to provide continuous discharge of total residual oxidant over an extended period of time (up to 4 weeks). The discharge will still need to meet all permit limitations. Prior to start of the continuous oxidant addition, permittee shall notify KDHE of the amount of dechlorinating /debrominating chemicals that will be needed during the continuous oxidant addition and the quantity of the chemicals available at the facility. Alternative use of non-oxidizing biocides, such as quaternary amines, will need approval of a clam/mussel control plan prior to use.

D. **SUPPLEMENTAL CONDITIONS** (Continued)

5. The permittee shall develop and implement an oxidation schedule indicating the time, dosage and duration of applications for each unit. The records shall be maintained and made available for review upon KDHE or EPA request. During continuous oxidant addition for macroinvertabrate control, as indicated in supplemental condition no. 4 above, the permittee shall submit, as a part of the discharge monitoring report, an oxidation schedule indicating the time, dosage and duration of applications for each unit.

6. This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2) and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:

   a. Contains different conditions or is otherwise more stringent than any effluent limitation in the permit, or

   b. Controls any pollutant not limited in the permit.

   The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

7. Changes in Discharges of Toxic Substances

   The permittee shall notify KDHE as soon as it knows or has reason to believe:

   a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following notification levels:

      (1) One hundred micrograms per liter (100 μg/l);

      (2) Two hundred micrograms per liter (200 μg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 μg/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

      (3) Five times the maximum concentration value reported for that pollutant in the permit application.

   b. That any activity has occurred or will occur which result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit if that discharge will exceed the highest of the following notification levels:

      (1) Five hundred micrograms per liter (500 μg/l);

      (2) One milligram per liter (1 mg/l) for antimony;

D. **SUPPLEMENTAL CONDITIONS** (Continued)

(3) Ten times the maximum concentration value reported for that pollutant in the permit application.

8. In the event the Environmental Protection Agency amends or promulgates the BPT, BAT and/or BCT effluent guideline limitations for a specific Point Source Category or any of the subcategories covering this facility, the permit will be revoked and reissued to incorporate the new limitation(s).

9. Toxic Substances - Water Treatment Additives. If the permittee utilizes or changes water treatment additives:

   a. After the mixing zone provided by Kansas Water Quality Standards, the discharge of water treatment additives shall not be harmful to human, animal or plant life uses in the receiving water.

   b. The permittee shall keep an ongoing log of the water treatment chemicals used, their potential concentration in the facility discharge, and the associated toxicity data for each chemical. A sample chemical additives evaluation log can be obtained from KDHE.

   c. The permittee shall provide KDHE, upon request, toxicity tests and/or a chemical additives evaluation log the permittee uses to determine if the requirements in the paragraphs above are being achieved. In the event the data indicate the requirements in the paragraphs above are not achieved, KDHE reserves the right to amend the facility's NPDES permit to specify additional terms and conditions for toxic substances.

10. Intermittent discharges such as demineralizer regeneration, coal pile runoff, etc. shall be sampled according to the designated measurement frequency when discharging.

11. The coal pile runoff pond shall be operated to maximize the settling of coal fines so as to minimize the amount of suspended solids released in the discharge.

12. There shall be no discharge from the old or new AQC ponds without prior approval from KDHE.

13. The use of earthen lagoons for the handling and treatment of certain types of industrial wastes is currently being reevaluated by the Kansas Department of Health and Environment. This is an ongoing effort resulting from increased emphasis, at both the state and federal level, in addressing source control as a mechanism for eliminating or minimizing the potential for groundwater contamination. The facility addressed by this permit has yet to be fully evaluated. As such, the Department may require the installation of groundwater monitoring wells or other necessary improvements to the wastewater handling and disposal system. The permittee will be notified and consulted concerning any monitoring well installation requirements or possible lagoon system modifications at a later

D. **SUPPLEMENTAL CONDITIONS** (Continued)

time. The installation of any monitoring wells or any modifications to the wastewater system requires prior approval by the Department.

14. Only domestic wastewater shall be directed to the sanitary waste treatment pond.

15. The wastewater treatment plant shall be under the supervision of a class I operator or higher who has been certified or is in the process of obtaining certification under K.S.A. 65-4501 et seq.

16. Permittee shall maintain and modify the existing stormwater pollution prevention plan as necessary in accordance with **ATTACHMENT A**. A copy of the SWP3 shall be kept on site and be available for KDHE or EPA inspection upon request.

17. Discharge of industrial stormwater (as defined in 40 CFR part 122.26 (b)(14)) from the facility, except for stormwater associated with construction activity disturbing 1 acre or more of soil, is authorized under this permit. Such discharges shall be in compliance with the Kansas Surface Water Quality Standards (KAR 28-16-28) and in conformance with the facility stormwater pollution prevention plan developed in accordance with **ATTACHMENT A**.

18. Information required by the 316(b) Phase II regulations, 40 CFR Part 125.95 et seq., shall be submitted to KDHE - Bureau of Water in accordance with the dates indicated in the Phase II regulations.

ATTACHMENT A

STORM WATER POLLUTION PREVENTION PLAN REQUIREMENTS AND GUIDELINES

The Storm water Pollution Prevention plan (SWP2 plan) shall be specific to the industrial activities and site characteristics occurring at the location described in this permit. The permittee shall fully implement the provisions of the SWP2 plan required under this permit as a condition of this permit.

The purpose of the SWP2 plan is to ensure the design, implementation, management, and maintenance of Best Management Practices (BMPs) in order to reduce the amount of pollutants in storm water discharges associated with the industrial activities at the facility. The SWP2 plan shall evaluate BMPs from each of three major classes: managerial/administrative; structural controls and non-structural controls.

The permittee shall evaluate, select, install, utilize, operate and maintain the BMPs in accordance with the concepts and methods described in Environmental Protection Agency (EPA) document number EPA 832-R-92-006, entitled ***Storm water Management for Industrial Activities*** *- Developing Pollution Prevention Plans and Best Management Practices*, published in September, 1992[1]; and the U.S. Environmental Protection Agency's *Final NPDES Storm Water Multi-Sector General Permit for Industrial Activities*; Notice dated Sept. 29, 1995, and subsequent modifications.

The SWP2 plan and any amendments shall be prepared by, or under the supervision of, and sealed by a Kansas licensed professional engineer. The SWP2 plan shall be reviewed and re-certified for compliance with accepted engineering standards for storm water pollution prevention at least once every five years. The plan shall contain, at a minimum, the following items:

1. Pollution Prevention Team - Specific individuals shall be identified within the facility organization as members of a Storm water Pollution Prevention Team who are responsible for developing, implementing, maintaining and revising the plan. Each member's responsibilities shall be clearly identified in the plan. The activities and responsibilities of the team shall address all aspects of the facility's storm water pollution prevention plan.

2. Description of potential pollutant sources - pollutant sources which may reasonably be expected to add significant amounts of pollutants to the storm water discharge shall be described. The description shall include, at a minimum:

    a. Site Map - a site map identifying: the outline drainage areas of each storm water outfall; the location of significant materials exposed to precipitation; storage tanks; scrap yards and general refuse areas; fuel storage and distribution areas; vehicle and equipment maintenance and storage areas; loading/unloading areas; waste treatment, storage or disposal areas; short and long term material storage areas (including but not limited to: supplies, construction materials, plant equipment, oils, fuels, used and unused solvents, cleaning materials, paint, water treatment chemicals, fertilizers, and pesticides); landfills; construction sites; stock piles; major spills or leaks; surface water bodies and existing structural control measures to reduce pollutants in storm water runoff (such as bermed areas, grassy swales, etc.).

    b. Inventory of Exposed Materials - a narrative description of significant materials handled, treated, stored, leaked, spilled or disposed of in a manner to allow exposure to storm water within the period starting three years prior to the date of this permit; existing structural and nonstructural control measures to reduce pollutants in storm water runoff; and any treatment the storm water receives. A list of significant spills and leaks of toxic / hazardous materials in exposed areas shall be maintained and kept updated.

    c. Sampling Data - a summary of existing sampling data.

    d. Risk Identification and Summary of Potential Pollutant Sources - A narrative description of the potential pollutant sources and pollutant parameter of concern shall be identified.

---

[1]The EPA Manual entitled ***Storm water Management for Industrial Activities*** *- Developing Pollution Prevention Plans and Best Management Practices*, and the *Final NPDES Storm Water Multi-Sector General Permit for Industrial Activities*; Notice dated Sept. 29, 1995 are available through the EPA Water Resources Center, at (202) 260-7786, e-mail waterpubs@epamail.epa.gov or the National Technical Information Services (NTIS). The NTIS publication number is PB92-235969. The NTIS order desk phone number is (800) 553-6847.

3. Measures and Controls - A description of storm water management controls appropriate for the facility which addresses the following minimum components, including a schedule for implementing such controls to the extent practical:

   a. Good housekeeping requiring the maintenance of areas in a clean, orderly manner including handling and storage areas (exposed to precipitation) for raw metals, scrap metals, fines, paints and other process areas.

   b. Preventive Maintenance - Including timely inspection and maintenance of storm water management devices, like oil water separators, catch basins etc.

   c. Spill Prevention and Response Procedures - Appropriate material handling procedure, storage requirements, use of equipment such as diversion valves, and procedures for cleaning up spills should be identified. Availability of the necessary equipment to implement a clean up should be addressed. The following areas should be addressed:

      (1) Metal fabrication and finishing areas - include measures for maintaining clean, dry, orderly conditions and use of dry clean-up techniques;

      (2) Receiving, Unloading and Storage Areas and Raw Material Storage Areas - include measures to prevent spills & leaks; easy access for spill clean-up; quick and correct identification of materials; and train employees on clean-up techniques.

      (3) Storage of Equipment - include procedures for proper clean-up and/or covering of equipment before storing outdoors.

      (4) Storage of Metal Working Fluids - measures to identify proper controls.

      (5) Cleaners and Rinse Water - Include measures to control spills, build-up and disbursement of sand from sand blasting, and use of less toxic cleaners.

      (6) Lubricating Oils and Hydraulic Fluids - include procedures for using detecting and control devices to reduce, prevent, and contain leaks and overflows.

      (7) Chemical Storage Areas - include a program to inspect containers, and identify proper disposal and spill controls to prevent storm water contamination.

   d. Inspections: Identification of qualified facility personnel to inspect at appropriate intervals designated equipment and storage areas for raw metal, finished product, materials and chemicals, recycling, equipment, paint, fueling and maintenance; and loading, unloading, and waste management areas. A set of tracking or follow-up procedures shall be used to ensure that appropriate actions are taken in response to the inspections. Records of inspections shall be maintained on-site for at least three years after the date of the inspection.

   e. Employee Training: Employee training programs to inform personnel responsible for implementing activities identified in the storm water pollution prevention plan or otherwise responsible for storm water management, at all levels of responsibility, of the components and goals of the storm water pollution prevention plan. The pollution prevention plan shall consider periodic dates for such training, but in all cases training must be held at least annually.

   f. Record keeping and Internal Reporting Procedures: A log to document a description of incidents (such as spills, or other discharges), along with other information which may impact the quality and quantity of storm water discharges needs to be developed and maintained. Reporting procedures, inspections and maintenance activities shall be developed and included in the SWP3 plan.

   g. Non-storm water Discharges -include a certification that the discharge has been tested or evaluated for the presence of dry weather flows. The certification should include all potential significant sources of dry weather flows, all analytical data for quality and quantity of such flows, and signature of the authorized person. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the dry weather flow component(s) of the discharge.

   h. Sediment and Erosion Control: Measures to minimize erosion in areas which, due to topography, activities, or other factors, have a high potential for significant soil erosion. At a minimum consider structural, vegetative, and/or stabilization measures to limit erosion. Must include measures to minimize erosion related to the high volume of traffic from heavy equipment for delivery to and from the facility and for equipment operating at the facility on a daily basis such as forklifts, cranes etc.

i. Management of Runoff: Describe and consider the appropriateness of traditional storm water management practices (practices other than those which control the generation or source(s) of pollutants) to divert, infiltrate, reuse or otherwise manage storm water runoff in a manner that reduces pollutants in storm water discharges from the site. Include that the measures that the permittee determines to be reasonable and appropriate should be implemented and maintained. The potential of various sources at the facility to contribute pollutants to storm water discharges associated with industrial activity (see Item 3.c) shall be considered when determining reasonable and appropriate measures to implement.

4. Comprehensive Site Compliance Evaluation - Qualified personnel shall conduct site compliance evaluations at least once a year. Such evaluations shall provide for:

   a. Visual inspection of areas contributing to a storm water discharge associated with industrial activity for evidence of, or the potential for, pollutants entering the drainage system. Evaluation of measures to reduce pollutant loadings to determine whether they are adequate and properly implemented in accordance with the terms of the permit or whether additional control measures are needed. A visual evaluation of equipment needed to implement the plan, such as spill response equipment and containment drums, shall be made to determine it is functioning properly and drums are not corroded.

   b. A report summarizing the scope of the evaluation, personnel making the evaluation, the date(s) of the evaluation, major observations relating to the implementation of the storm water pollution prevention plan, and any actions taken shall be made and retained as part of the storm water pollution prevention plan. Where a report does not identify any incidents of noncompliance, a certification that the facility is in compliance with the storm water pollution prevention plan and this permit needs to be included in the plan.

5. Monitoring and Record Keeping Requirements.

   a. Visual Examination of Storm Water Quality: The permittee shall perform and document at least one visual examination of a storm water discharge associated with industrial activity from each identified storm water outfall. Visual examination reports shall be maintained in the plan. Each report shall include the date and time, name of the person performing examination, nature of discharge (runoff or snow melt), visual quality of the discharge (i.e., color, odor, clarity, floating solids, suspended solids, foam, oil sheen, and other indicators of storm water pollution) and probable sources of any observed contamination.

   b. To ensure the adequacy of the best management practices developed within the SWP2 plan, the permittee needs to periodically monitor[2] the storm water discharges during wet weather events for potential contaminants which may reasonably be expected to be present in the discharge. Record of all storm water monitoring reports, unless otherwise indicated in this permit, shall be kept on file.

6. The plan shall be re-evaluated and modified in a timely manner, but in no case more than 12 weeks after:

   a. a change in design, construction, operation or maintenance that has a significant effect on the potential for the discharge of pollutants to the waters of the State, or

   b. the permittee's inspections (including the regular comprehensive site compliance evaluation required herein) indicate deficiencies in the SWP2 plan or any BMP; or

   c. a visual inspection of contributing areas or a visual inspection of the storm water discharges or monitoring of the storm water discharges indicate the plan appears to be ineffective in eliminating or significantly minimizing pollutants from sources identified in the plan.

---

[2] For sampling methods and procedures please refer to ***NPDES STORM WATER SAMPLING GUIDANCE DOCUMENT, EPA 833-B-92-001***. This document can be obtained by calling (202) 564-0746 or the National Technical Information Service (NTIS) at (800) 553-6847.

15. Permit Modifications and Terminations: As provided by KAR 28-16-62, after notice and opportunity for a hearing, this permit may be modified, suspended or revoked or terminated in whole or in part during its term for cause as provided, but not limited to those set forth in KAR 28-16-62 and KAR 28-16-28b through f. The permittee shall furnish to the Director, within a reasonable amount of time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish upon request, copies of all records required to be kept by this permit.

16. Toxic Pollutants: Notwithstanding paragraph 15 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified at such effluent standards) is established under 33 USC Section 1317(a) for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition. Nothing in this permit relieves the permittee from complying with federal toxic effluent standards as promulgated pursuant to 33 USC Section 1317.

17. Civil and Criminal Liability: Except as authorized in paragraph 9 above, nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance as provided for in KSA 65-170d, KSA 65-167, and 33 USC Section 1319.

18. Oil and Hazardous Substance Liability: Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties to which the permittee is or may be subject to under 33 USC Section 1321 or KSA 65-164 et seq. The municipal permittee shall promptly notify the Division by telephone upon discovering crude oil or any petroleum derivative in its sewer system or wastewater treatment facilities.

19. Industrial Users: The municipal permittee shall require any industrial user of the treatment works to comply with 33 USC Section 1317, 1318 and any industrial user of storm sewers to comply with 33 USC Section 1308.

20. Property Rights: The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights nor any infringements of or violation of federal, state or local laws or regulations.

21. Operator Certification: The permittee shall ensure the wastewater facilities are under the supervision of an operator certified by the Department. If the permittee does not have a certified operator or loses its certified operator, appropriate steps shall be taken to obtain a certified operator as required by KAR 28-16-30 et seq.

22. Severability: The provisions of this permit are severable. If any provision of this permit or any circumstance is held invalid, the application of such provision to other circumstances and the remainder of the permit shall not be affected thereby.

23. Removal from Service: The permittee shall inform the Division at least three months before a pumping station, treatment unit, or any other part of the treatment facility permitted by this permit is to be removed from service and shall make arrangements acceptable to the Division to decommission the facility or part of the facility being removed from service such that the public health and waters of the state are protected.

24. Duty to Reapply: A permit holder wishing to continue any activity regulated by this permit after the expiration date, must apply for a new permit at least 180 days prior to expiration of the permit.

STANDARD CONDITIONS FOR KANSAS WATER POLLUTION CONTROL AND NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT

1. Representative Sampling:

   A. Samples and measurements taken as required herein shall be representative of the nature and volume of the monitored discharge. All samples shall be taken at the location designated in this permit, and unless specified, at the outfall(s) before the effluent joins or is diluted by any other water or substance.

   B. Monitoring results shall be recorded and reported on forms acceptable to the Division and postmarked no later than the 28th day of the month following the completed reporting period. Signed and certified copies of these, prepared in accordance with KAR 28-16-59 and all other reports required herein, shall be submitted to:

      Kansas Department of Health & Environment
      Bureau of Water-Technical Services Section
      1000 SW Jackson Street, Suite 420
      Topeka, KS 66612-1367

2. Schedule of Compliance: No later than 14 calendar days following each date identified in the "Schedule of Compliance," the permittee shall submit to the above address, either a report of progress or, in the case of specific action being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements, or, if there are no more scheduled requirements, when such noncompliance will be corrected.

3. Definitions:

   A. The "daily average" discharge means either the total discharge by weight during a calendar month divided by the number of days in the month that the facility was operating or the average concentration for the month. The daily average discharge shall be determined by the summation of all measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made, or by the summation of all concentrations determined during the calendar month divided by the number of samples collected and analyzed.

   B. The "daily maximum" discharge means the total discharge by weight or average concentration during a 24 hour period.

   C. The "monthly average", other than for fecal coliform bacteria, is the arithmetic mean of the value of effluent samples collected in a period of 30 consecutive days. The monthly average for fecal coliform bacteria is the geometric mean of the value of the effluent samples collected in a period of 30 consecutive days.

   D. The "weekly average", other than for fecal coliform bacteria, is the arithmetic mean of the value of effluent samples collected in a period of 7 consecutive days. The weekly average for fecal coliform bacteria is the geometric mean of the value of effluent samples collected in a period of 7 consecutive days.

   E. A "grab sample" is an individual sample collected in less than 15 minutes.

F. A "composite sample" is a combination of individual samples in which the volume of each individual sample is proportional to the discharge flow, the sample frequency is proportioned to the flow rate over the sample period, or the sample frequency is proportional to time.

G. The "act" means the Clean Water Act, 30 USC Section 1251 et seq.

H. The terms "Director", "Division", and "Department" refer to the Director, Division of Environment, Kansas Department of Health and Environment, respectively.

I. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

J. "Bypass" means any diversion of waste streams from any portion of a treatment facility or collection syste

4. Test Procedures: All analysis required by this permit shall conform to the requirements of 33 USC Section 1314(h), and shall be conducted in a laboratory certified by this Department. For each measurement or sample, the permittee shall record the exact place, date, and time of sampling; the date of the analyses, the analytical techniques or methods used, and the individual(s) who performed the sampling and analysis and, the results. If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved procedures, the results shall be included in the Discharge Monitoring Report form required in 1.B. above. Such increased frequencies shall also be indicated.

5. Records Retention: All records and information resulting from the monitoring activities required by this permit, including all records of analyses and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation, shall be retained for a minimum of 3 years, or longer if requested by the Division.

6. Change in Discharge: All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant not authorized by this permit or of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of this permit. Any anticipated facility expansions, productions or flow increases, or process modifications which result in a new, different, or increased discharge of pollutants shall be reported to the Division at least one hundred eighty (180) days before such chang

7. Noncompliance Notifications: If for any reason, the permittee does not comply with, or will be unable to comply with any daily maximum or weekly average effluent limitations specified in this permit, the permittee shall provide the Department with the following information in writing within five days of becoming aware of such condition:

A. A description of the discharge and cause of noncompliance, and

B. the period of noncompliance including exact dates and times or if not corrected, the anticipated time the noncompliance is expected to continue and steps taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

The above information shall be provided with the submittal of the regular Discharge Monitoring Report form for violations of daily average or monthly average effluent limitations.

8. Facilities Operation: The permittee shall at all times maintain in good working order and efficiently and effectively operate all treatment, collection, control systems or facilities, to achieve compliance with the terms of this permit. Such proper operation and maintenance procedures shall also include adequate laboratory controls and appropriate quality assurance procedures. Maintenance of treatment facilities which results in degradation of effluent quality, even though not causing violations of effluent limitations shall be scheduled during noncritical water quality periods and shall be carried out in a manner approved in advance by the Division. The permittee shall take all necessary steps to minimize or prevent any adverse impact to waters of the State resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge. When necessary to maintain compliance with the permit conditions, the permittee shall halt or reduce those activities under its control which generate wastewater routed to this facility.

9. Immediate Reporting Required: Any diversion from, or bypass of facilities necessary to maintain compliance with the permit is prohibited, except: where no feasible alternatives to the bypass exist and 1) where necessary to prevent loss of human life, personal injury or severe property damage; or 2) where excessive stormwater inflow or infiltration would damage any facilities necessary to comply with this permit or 3) where the permittee notifies the Director seven days in advance of an anticipated bypass. The Director or Director's designee may approve a bypass, after considering its adverse effects, if any of the three conditions listed above are met. The permittee shall immediately notify the Division by telephone [(913) 296-5517 or the appropriate KDHE District Office] of each bypass and shall confirm the telephone notification with a letter explaining what caused this spill or bypass and what actions have been taken to prevent recurrence. Written notification shall be provided to the Director within five days of the permittee becoming aware of the bypass. The Director or Director's designee may waive the written report on a case-by-case basis.

10. Removed Substances: Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner acceptable to the Division.

11. Power Failures: The permittee shall provide an alternative power source sufficient to operate the wastewater control facilities or otherwise control pollution and all discharges upon the loss of the primary source of power to the wastewater control facilities.

12. Right of Entry: The permittee shall allow authorized representatives of the Division of Environment or the Environmental Protection Agency upon the presentation of credentials, to enter upon the permittee's premises where an effluent source is located, or in which are located any records required by this permit, and at reasonable times, to have access to and copy any records required by this permit, to inspect any monitoring equipment or monitoring method required in this permit, and to sample any influents to, discharges from or materials in the wastewater facilities.

13. Transfer of Ownership: The permittee shall notify the succeeding owner or controlling person of the existence of this permit by certified letter, a copy of which shall be forwarded to the Division. The succeeding owner shall secure a new permit. The permit is not transferable to any person except after notice and approval by the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary.

14. Availability of Records: Except for data determined to be confidential under 33 USC Section 1318, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. Effluent data shall not be considered confidential. Knowingly making any false statement on any such report or tampering with equipment to falsify data may result in the imposition of criminal penalties as provided for in 33 USC Section 1319 and KSA 65-170c.

LACYGNE LANDFILL
EMERGENCY RESPONSE ACTION PLAN

KANSAS CITY POWER & LIGHT COMPANY
LACYGNE GENERATING STATION
25166 E 2200 ROAD
LACYGNE, KANSAS 66040

August, 2010

Prepared by
KANSAS CITY POWER & LIGHT
ENVIRONMENTAL SERVICES

LACYGNE GENERATING STATION
LANDFILL EMERGENCY RESPONSE ACTION PLAN

This Landfill Emergency Response Action Plan (LERAP) for the Kansas City Power and Light (KCP&L) LaCygne Generating Station Landfill in LaCygne, Kansas, has been prepared for easy access by response personnel during an actual emergency or spill.

<u>TABLE OF CONTENTS</u>

LANDFILL EMERGENCY RESPONSE ACTION PLAN

1. Emergency Coordinator Information

The Emergency Coordinator is the LaCygne Environmental Compliance Administrator (ECA), who is responsible for addressing spills at the Station. The Qualified Individual has full authority to implement the LERAP.

Name: Ms. Theresa Goin
Position: ECA – LaCygne Generating Station
Facility Address: 25166 E 2200 Road, LaCygne, Kansas 66040
Emergency Telephone Number (Facility): (913) 402-4136
Emergency Telephone Number (Cell): (816) 517-9274

2. Emergency Notification Telephone List

The emergency notification telephone list identifies and prioritizes the names and telephone number of the organizations and personnel that may need to be notified immediately in the event of a spill emergency The ECA or other qualified individual will decide notification.

Organization	Phone Number
1. 1. National Response Center (NRC):	(800) 424-8802
2. 2. U.S. EPA – Region 7	(913) 281-0991
3. Kansas Department of Health and Environment (KDHE)	(785) 249-1429
KDHE Evening Phone:	(785) 231-2759

Emergency Coordinator – Ms. Theresa Goin, Environmental Compliance Administrator

Office (LaCygne Generating Station):	(913) 402-4136
Evening Phone:	(816) 517-9274

Other Numbers

1. Kansas City Power & Light Company – Environmental Services Corporate Office – John Horn :	(816) 556-2007
2. Linn County Fire-Rural District No.1 – LaCygne, Kansas:	(913) 352-6480
3. 911	
4. Sheriff's Department – Linn County, Kansas:	(913) 795-2666
5. Kansas Highway Patrol, Troop H, Chanute, Kansas:	(620) 431-2100
6. Linn Country Local Emergency Planning Committee:	(913) 352-6480
7. Local Weather Report (Nat'l Weather Office)	(800) 438-0596

Hospitals

1. Fort Scott Mercy, Fort Scott KS:		(620) 223-2200
2. Miami Co. Medical Center, Paola KS	(913) 294-2327	ER (913) 294-6655
3. Bates County Memorial, Butler MO		(660) 679-4135

3. Spill Response Notification Form

Below is a checklist of information that will be provided to the applicable response agencies and personnel in case of a reportable spill:

Person Reporting Spill ____

Title/Position:____

Telephone Numbers: Day __(913) 402-4136____

Evening _(913) 632-0833/0834 (24 hour emergency number)__________

Company:__________Kansas City Power & Light Company________________________

Organization Type:___LaCygne Generating Station________________________________

Address:_____25166 E 2200 Road, LaCygne, Kansas 66040_______________

Facility Latitude: Degrees:___38_____ Minutes:_____20____Seconds:_____48__________

Facility Longitude: Degrees:_94_____ Minutes:_____38____Seconds:_____30__________

INCIDENT DESCRIPTION

Were Materials Discharged?_______(Y/N) Confidential?______________(Y/N)

Meeting Federal Obligations to Report?__________(Y/N) Date Called:_______________

Calling for Responsible Party?___________(Y/N) Time Called:_____________________

Source and/or Cause of Incident:____

____

Date of Incident:____

Time of Incident:_________________AM/PM

Incident Address/Location:____

Nearest City:_LaCygne_____State:_KS____County:____________Linn___Zip:___66040_

Distance from City (Miles):__7______ Direction from City:_East_________

Section:______SE ¼ 33____Township:____19 S________Range:______25 E___

MATERIAL SPILLED

Product Discharged quantity Unit of Measure

____

____

3. Spill Response Notification Form, Continued

RESPONSE ACTION

Actions Taken to Correct, Control or Mitigate Spill Incident:

____

____

____

IMPACT

Number of Injuries:________Number of Deaths:________

Were there Evacuations?_________(Y/N) Number Evacuated:________

Was there any Damage?_________(Y/N)

Damage in Dollars (approximate):____

Medium Affected:____

Description:____

More information about Medium:____

____

ADDITIONAL INFORMATION

Any information about the incident not recorded elsewhere in the report:

____

____

____

____

CALLER NOTIFICATIONS

EPA?_______(Y/N) State of Kansas - KDHE?

___________(Y/N)

WEATHER INFORMATION

Temperature: _______________________

____

Sky (Sunny/cloudy, etc.): _____________

____

Wind Speed and Direction: ____________

____

____

____

____

____

____

4. Response Equipment

On site heavy equipment contractors are available through the shift foreman for spill response on a 24 hour basis. Assessment of the situation will dictate what equipment is needed.

5. Facility Response Team

The facility response team includes designated LaCygne Station personnel, designated KCPL employees in the Environmental Services office in Kansas City, Missouri, and Emergency Spill Contractors who are under contract to the facility for response activities.

Date of last update: August 2010

Coordinator	Response time (minutes)	Phone (day/evening)
1. On Duty Shift Foreman	at LaCygne Facility 5 min	20833/20834 (Internal)
2. Theresa Goin Qualified Individual	when at facility 5 minutes from home 60 Minutes	Plant - (913) 402-4136 Cell (816) 517-9274
3. John Horn– KCPL Environmental Services Spills	1-2.0 Hours	(Office) (816) 556-2007 (Cell) (913-449-0553 Evening (913) 894-5654
4. Bob Beck-KCPL Environmental Services NPDES Issues	1-2.0 Hours	(Office) (816) 654-1767 (Cell) (816) 665-9442 Evening (816) 524-5980

6. Evacuation Plan and Traffic Plan

Due to the nature of possible landfill failures, it is not expected that any evacuation will be needed. Even if the entire contents of the impoundments were to go into the lake, the water level would not rise enough to overtop the dam or cause shoreline flooding.

Berm failure of the impoundments could cause plant traffic to be rerouted. Response equipment could also block roads around the landfill. The reroute would be the responsibility of plant operations.

7. Immediate Actions in Case of a Spill

In case of a spill, the following immediate actions will be conducted to ensure the safety of the facility and to mitigate or prevent discharges. The Shift Foreman will notify the Qualified Individual who will initiate the actions on the Immediate Action Flowchart including calls to contractors. The Qualified Individual may rely upon the KCPL operators and staff at the Station or the central dispatch to make the calls.

In the event of a discharge the Facility Response Team will be mobilized. Additional spill response contractors will be contacted for mobilization on site, as needed.

Initial response to a breach in the impoundment berms would be to lower the water level in the impoundment. Isolate the breached pond and redirect process water from entering the damaged section. The emergency spillway in the berm may need to be opened to lower the water level if that will lessen the water pressure at the breach. Steps to stop water flow out of the impoundment can include stopping up the breach with soil or dry landfill material.

Solid material may flow out of a breached impoundment. Water flow will carry suspended particles eroded from the fill material so stopping the water flow as soon as possible is imperative. The consolidated solids in the impoundments could slump through a breach to fan out into a delta outside the breach. This material should be picked up and hauled to the dry landfill when dewatered.

If a berm begins to show signs of imminent failure, the initial response should be to remove as much water from that impoundment as possible. The berm should be reinforced from outside with compacted fill material until a thorough engineering study can be made to determine a permanent repair.

Any unusual soil movement on the outer slopes of the berm should be reported to the Emergency Coordinator immediately.

8. LANDFILL SPILL RESPONSE IMMEDIATE ACTION FLOW CHART

WHEN SPILL OBSERVED

CONTACTS

↓

CONTACT SHIFT FOREMAN

↓

Shift foreman contacts ECA or the Ops. Superintendent, if the ECA is unavailable to fill the role of Emergency Coordinator.

↓

Determine if the spill violates applicable water quality standards (40 CFR 110.11)

↓

Is a sludge or emulsion deposited beneath the surface of the lake?

↓

If YES

↓

The Emergency Coordinator will make the required regulatory notifications

↓

IF NO

↓

No notification necessary

OPERATIONS

↓

STOP SOURCE OF SPILL

↓

Is a contractor necessary?

↓

IF YES

↓

Emergency Coordinator will contact contractor and utilize available KCPL personnel to reduce release.

↓

IF NO

↓

Emergency Coordinator will utilize KCPL personnel to stop release and begin cleanup

↓

Contain spill to land; prevent contact with water where possible

↓

Stabilize berms where necessary and fill breach.

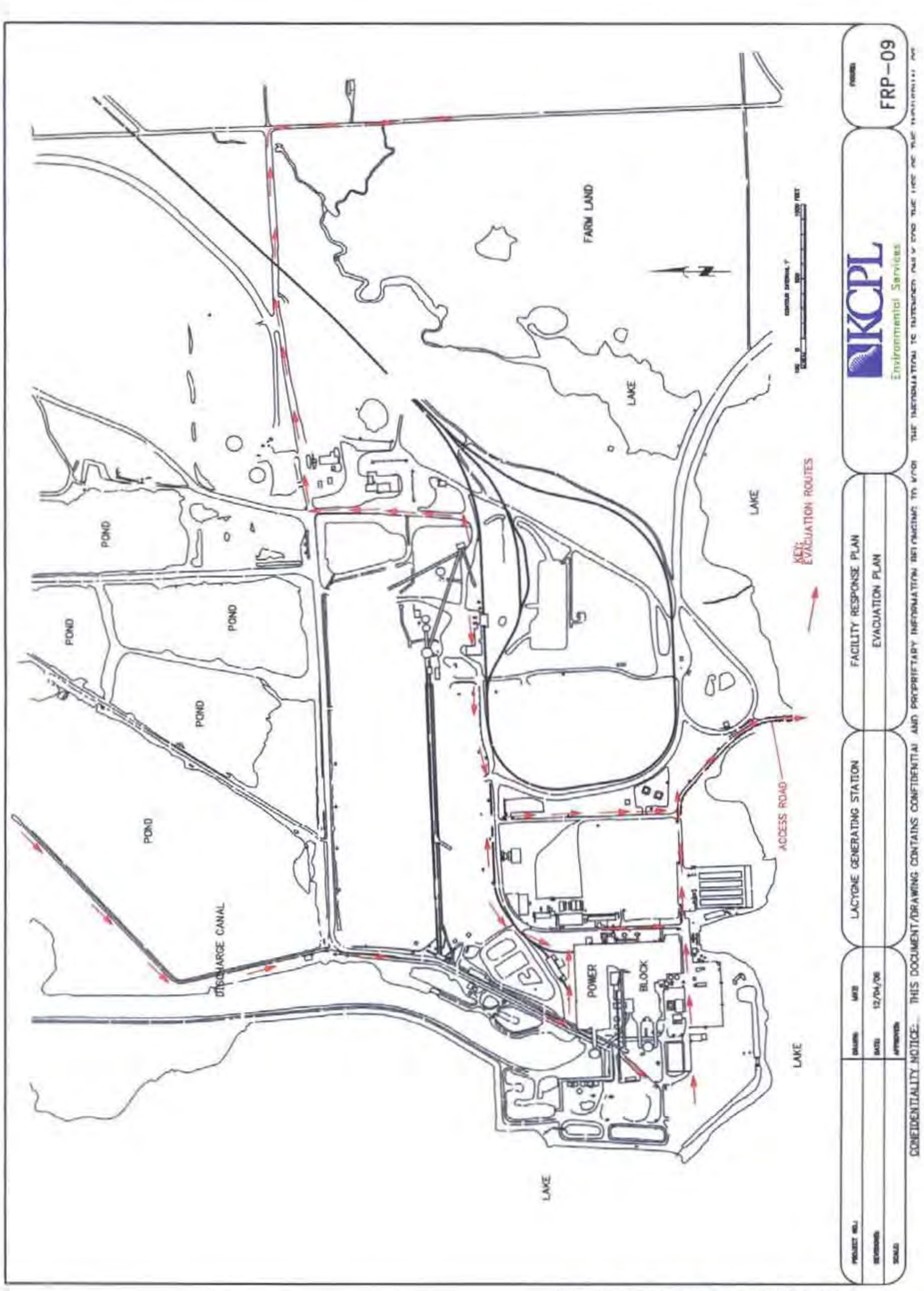
↓

Complete cleanup and restore impoundments to safe condition

↓

Any regulatory follow-up reports will be drafted by the ECA for review and submittal by Environmental Services

9. Facility Map



URS

September 15, 2009
URS Project 16530488

Mr. Paul Ling
Kansas City Power & Light
P.O. Box 418679
Kansas City, Missouri 64141-9679

Re: Safe Water Level Study
Upper AQC Pond
La Cygne Power Generation Station
La Cygne, Kansas

Dear Mr. Ling:

Transmitted with this letter is URS Corporation's report on analyses made to evaluate safe operating water levels within the Upper AQC Pond at the referenced site. Keeping water levels at or below the safe water levels identified in our report allow the pond to store precipitation from the design storm and maintain a freeboard of one foot.

We appreciate the opportunity to work with you on this project. If you have any questions regarding this report, please call.

Very truly yours,
URS Corporation

L. Todd Bond, P.E.
Project Engineer

Brian D. Linnan, P.E.
Project Manager

BRIAN D. LINNAN LICENSED 10810 KANSAS PROFESSIONAL ENGINEER

URS Corporation
8300 College Boulevard
Suite 200
Overland Park, KS 66210
Tel: 913.344.1000
Fax: 913.344.1011

SAFE WATER LEVEL STUDY
UPPER AQC POND
KCP&L LA CYGNE POWER GENERATION STATION
LA CYGNE, KANSAS

Prepared for
Kansas City Power & Light
P.O. Box 418679
Kansas City, Missouri 64141-9679

September 2009

URS Corporation
8300 College Boulevard
Suite 200
Overland Park, Kansas 66210

Project No. 16530488

TABLE OF CONTENTS

List of Tables

List of Drawings

The purpose of this study is to evaluate the maximum safe operation water level in the Upper AQC while maintaining a reserve storage capacity to retain the design storm event and maintain a minimum freeboard of one foot.

The U.S. Army Corps of Engineers HEC-HMS computer software was used in the preparation of this report. The following assumptions are made:

- At the time of the rainfall event, all of pond basins will either be inundated with standing water or any exposed ground will be saturated.
- At the time of the rainfall event, all interconnected pond basins are at their maximum safe water elevation.
- SCS curve number of 98 was used in the modeling calculations to establish peak runoff and total volume runoff quantities.
- Manning's n used in time of concentration calculations is 0.45 (sheet flow).
- Minimum freeboard of one foot.
- All stormwater will be contained on site, no release from the pond.
- The water surface elevations of all hydraulically connected pond basin will equalize prior to any evapotranspiration losses.
- 25-Year, 24-Hour design storm, Type II SCS storm, 6.4-inch rainfall per TR-55, Second Ed., June 1986.

The Upper AQC Pond was divided into nine basins for analysis. The basins were delineated based on the existing placement of dikes, control structures and interconnecting drainage pipes. A table of basins and storage capacity calculations is included in Table 1.

The access road surrounding the basins is at a nearly constant elevation of 890 feet. The access road is elevated above the surrounding areas; consequently, no offsite stormwater enters the pond basins.

3.1 BASIN A

Basin A is used for evapotranspiration. The discharge point for Basin A is Basin I. Excess waste is carried to Basin I via two, 18-inch diameter steel pipes. The upstream flowlines for these pipes are approximately 888.5 feet. These pipes are capable of conveying flows during the lower intensity storms. During high intensity storms, the excess stormwater will over top the internal berm between Basin A and Basin B at the north end of Basin A and flow to Basins B and ultimately into Basin D.

3.2 BASINS B AND C

Basins A and B are used for evapotranspiration of excess water. Water is pumped from the Lower AQC Pond to Basins B and C and allowed to cover the basin with shallow standing water.

The basins A and B are separated by a dike with an opening in the dike to allow free movement of water from one to the other. Hydraulically, Basins B and C operate as a single basin. Excess stormwater from these basins flows to Basin D.

3.3 BASIN D

Basin D is heavily vegetated in the upper reach of the basin. The majority of the basins are either bare ash or standing water, both conditions were modeled using a SCS Curve Number of 98. Release from Basin D is controlled by a broad crested weir located along the southern dike of the basin. The low elevation of the weir is approximately 888 feet. A low flow weir is incorporated into the weir. This low flow weir is approximately 14 feet in width and 0.4 feet in depth. For purposes of modeling, that weir was modeled at an elevation of 888 feet to evaluate the storage capacity of the basin. Overflow from Basin D is captured in Basin E.

3.4 BASINS E THROUGH G

Basin F is the receiving basin for the ash effluent from the plant. All three basins are void of vegetation and hydraulically connected by discontinuities in the dike separating the basins. The hydraulic sequence of these basins is as follows:

1. Effluent is pumped to Basin F.

2. Effluent is conveyed to Basin E through a low area in the dike separating Basins F and E.

3. The effluent is conveyed to Basin G by another low area in the dike separating Basins E and G.

4. Basin H is hydraulically connected to Basin G by four, 18-inch diameter steel pipes. The flowlines of these pipes are approximately 10 feet below the elevation of the dike and remain submerged most of the time.

5. An inlet is located at the south side of the basin. This inlet can be used to recycle water from Basin H back to the power plant. This point is hydraulically the farthest point from the effluent discharge point in Basin F.

An emergency spillway is located at the southern end of Basin F. The original construction plans indicate the spillway is broad crested weir 50 feet in length measured along the bottom. Side slopes from the bottom to the top of the dike are 4H:1V. The flow line of the weir is 887.0 feet.

3.5 BASIN H

Basin H is hydraulically downstream from Basin G. Basin H is connected to Basin G by four, 18-inch diameter steel pipes. The pipes are submerged the majority of the time and allow the water levels to equalize between Basin H and Basins E-G. Basin I is upstream of Basin H. Basin I is very shallow. For the purposes of modeling, Basin I is assumed to have no storage capacity. Any stormwater captured by Basin I is carried to Basin H.

3.6 BASIN I

Basin I is downstream of Basin C. Basin I discharges to Basin H by two, 18-inch diameter steel pipes. The water surface elevation of Basin I is considerably higher than Basin H and above the established safe water elevation of Basins E-G and Basin H. Given the elevation of the water in the basin at the time of the survey, the basin was modeled as being nearly full and provided no storage capacity.

The U.S. Army Corps of Engineers HEC-HMS computer software was used to calculate the peak discharges and total volume of captured stormwater for each basin. A 25-year, 24-hour design storm of 6.5 inches of total precipitation was used in the model. The U.S. Department of Agriculture's TR-55 was used in determining the precipitation amount for Linn County, Kansas.

Time of concentration was calculated in accordance with the guidelines of TR-55 for sheet flow and shallow flows follows.

Sheet Flow:

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}}$$

T_t = travel time (hr)

n = Manning's roughness coefficient (table 3-1)
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ft)

Shallow Concentrated Flow (unpaved surfaces):

$$v = 16.1345(s)^{0.5}$$

v = velocity (ft/sec)

s = slope (ft/ft)

The time of concentration for those basin assumed to be inundated was set at 10 minutes. This is consistent with stormwater modeling for detention basins and other bodies of water as well. Calculations are summarized in Table 2.

Peak discharge and total volume for the individual basin was established using HEC-HMS. Table 3 summarizes the pertaining basin data as well as the resulting peak discharges and total volumes.

The procedures used in developing the safe water elevation are as follows:

1. The volume from Basin A and B are drained through Basin D.

2. The volume from Basin D is added to Basins A and B.

3. The deficit between the combined volumes and the available storage in Basin D is carried to Basin E via broad crested weir between Basins D and E.

4. Total volumes for Basins E-G are added to Basin D deficit to evaluate capacity required in Basins E-G.

5. Total volumes from Basin C, H & I are added to previous volumes to evaluate overall site storage requirements.

6. Combined storage volumes for Basins E-H are used to evaluate the maximum beginning water surface elevation based on as final water surface elevation of 886.0 feet.

7. Maximum safe water elevations are rounded to lower 0.5 feet increment.

Storage Determination Procedure

1	Volume from Basins A and B	59.1 ac-ft.	
2	Basin D Volume	13.3 ac-ft.	
	Combined Volume Basins A, B & D	72.4 ac-ft.	
	Basin D Storage @ 888.0	47.75 ac-ft.	
3	Basin D Storage Deficit	-24.65 ac-ft.	
	Total Volume Basins E-G	62.6 ac-ft.	
	Basin D Deficit	24.65 ac-ft.	
4	Req'd Capacity Basins E-G	87.25 ac-ft.	
	Total Volume Basins C, H & I	37.1 ac-ft.	
	Req'd Capacity Basins E-G	87.25 ac-ft.	
5	Total Site Storage Requirements	124.35 ac-ft.	
6	From Stage Storage Table for Combined Basins E-H and Req'd Vol = 124.35 ac-ft.		884.93 feet
7	**Set Safe Water Elevation at**		**884.5 feet**

Table 1
Basin Volume Calculations
Safe Water Level Study
Upper AQC Pond
La Cygne Power Generation Station

	Elev. (ft)	Area (sf)	Avg. Area (sf)	Inc. Storage (cf)	Cumm. Storage (cf)	Cumm. Storage (ac-ft)
Basin A						
	889	328,826.00				
	890	730,760.00	529,793	529,793	529,793	12.162
Basin B						
	888	99,315				
	889	1,016,755	558,035	558,035	558,035	12.811
	890	2,354,138	1,685,447	1,685,447	2,243,482	51.503
Basin C						
	889	2,595				
	890	2,354,138	1,178,367	1,178,367	1,178,367	27.052
Basin D						
	883	109,497				0.000
	884	193,131	151,314	151,314	151,314	3.474
	885	311,917	252,524	252,524	403,838	9.271
	886	530,659	421,288	421,288	825,126	18.942
	887	886,284	708,471	708,471	1,533,598	35.207
	888	1,014,524	950,404	950,404	2,484,002	57.025
	889	1,030,683	1,022,604	1,022,604	3,506,605	80.501
	890	1,120,255	1,075,469	1,075,469	4,582,074	105.190
Basin E						
	882	1,174,956				
	883	1,225,615	1,200,285	1,200,285	1,200,285	27.555
	884	1,264,972	1,245,293	1,245,293	2,445,579	56.143
	885	1,294,956	1,279,964	1,279,964	3,725,543	85.527
	886	1,311,657	1,303,307	1,303,307	5,028,850	115.447
	887	1,323,877	1,317,767	1,317,767	6,346,617	145.698
	888	1,334,624	1,329,251	1,329,251	7,675,868	176.214
	889	1,346,288	1,340,456	1,340,456	9,016,323	206.986
	890	1,455,632	1,400,960	1,400,960	10,417,283	239.148

Table 1
Basin Volume Calculations
Safe Water Level Study
Upper AQC Pond
La Cygne Power Generation Station
(Continued)

Basin F	Elev. (ft)	Area (sf)	Avg. Area (sf)	Inc. Storage (cf)	Cumm. Storage (cf)	Cumm. Storage (ac-ft)
	881	1,373,475				
	882	1,560,036	1,466,755	1,466,755	1,466,755	33.672
	883	1,734,311	1,647,173	1,647,173	3,113,929	71.486
	884	1,830,797	1,782,554	1,782,554	4,896,482	112.408
	885	1,994,934	1,912,865	1,912,865	6,809,348	156.321
	886	2,195,013	2,094,974	2,094,974	8,904,321	204.415
	887	2,436,912	2,315,963	2,315,963	11,220,284	257.582
	888	2,681,314	2,559,113	2,559,113	13,779,397	316.331
	889	2,708,169	2,694,742	2,694,742	16,474,139	378.194
	890	2,955,501	2,831,835	2,831,835	19,305,974	443.204

Basin G	Elev. (ft)	Area (sf)	Avg. Area (sf)	Inc. Storage (cf)	Cumm. Storage (cf)	Cumm. Storage (ac-ft)
	882	699,301				
	883	708,017	703,659	703,659	703,659	16.154
	884	713,917	710,967	710,967	1,414,626	32.475
	885	720,988	717,452	717,452	2,132,078	48.946
	886	728,179	724,584	724,584	2,856,661	65.580
	887	734,343	731,261	731,261	3,587,922	82.367
	888	750,840	742,592	742,592	4,330,514	99.415
	889	761,333	756,086	756,086	5,086,600	116.772
	890	818,586	789,960	789,960	5,876,560	134.907

Basin H	Elev. (ft)	Area (sf)	Avg. Area (sf)	Inc. Storage (cf)	Cumm. Storage (cf)	Cumm. Storage (ac-ft)
	880	809,135				
	881	841,957	825,546	825,546	825,546	18.952
	882	880,795	861,376	861,376	1,686,921	38.726
	883	913,747	897,271	897,271	2,584,192	59.325
	884	934,917	924,332	924,332	3,508,524	80.545
	885	952,361	943,639	943,639	4,452,163	102.208
	886	961,868	957,114	957,114	5,409,278	124.180
	887	970,534	966,201	966,201	6,375,479	146.361
	888	983,948	977,241	977,241	7,352,719	168.795
	889	996,437	990,192	990,192	8,342,912	191.527
	890	1,082,575.67	1,039,506	1,039,506	9,382,418	215.391

Table 1
Basin Volume Calculations
Safe Water Level Study
Upper AQC Pond
La Cygne Power Generation Station
(Continued)

Basin I	Elev. (ft)	Area (sf)	Avg. Area (sf)	Inc. Storage (cf)	Cumm. Storage (cf)	Cumm. Storage (ac-ft)
	886	33,939				
	887	180,125	107,032	107,032	107,032	2.457
	888	395,680	287,903	287,903	394,935	9.066
	889	428,657	412,168	412,168	807,103	18.529
	890	580,846	504,751	504,751	1,311,854	30.116

Table 2
Time of Concentration
Safe Water Level Study
Upper AQC Pond
La Cygne Power Generation Station

	Sheet Flow				Shallow Concentration					Total	
Drainage Area	Manning's n	Length (ft)	Slope (ft/ft)	T_{T1} (hrs)	Length (ft)	Slope (ft/ft)	Paved (y/n)	Velocity (ft/sec)	T_{T2} (hrs)	Time of Concentration $T_T=T_{T1}+T_{T2}+T_{T3}$(hrs)	Lag Time (min)
A	0.450	100	0.0013	1.09	3400	0.0012	n	0.56	1.69	2.78	100
B	0.450	100	0.0011	1.17	1050	0.0027	n	0.84	0.35	1.51	55
C	0.450	100	0.0014	1.06	1980	0.0014	n	0.60	0.91	1.97	71
D	0.450	100	0.005	0.64	900	0.005	n	1.14	0.22	0.86	31
E	Standing water in pond. Used Tc=10 min.									0.17	6
F	Standing water in pond. Used Tc=10 min.									0.17	6
G	Standing water in pond. Used Tc=10 min.									0.17	6
H	Standing water in pond. Used Tc=10 min.									0.17	6
I	Standing water in pond. Used Tc=10 min.									0.17	6

Table 3
Basin Summary Data
Safe Water Level Study
Upper AQC Pond
La Cygne Power Generation Station

Basin Summary Data									
Basin	Area (sf)	Area (ac)	T_C (hrs)	T_C (min)	CN	Q_{25} (cfs)	Volume (ac-ft)	Storage at Safe Water Elevation (ac-ft)	Safe Water Elevation (ft)
A	906,578	20.81	2.781	167	98	27.5	10.5	-	N/A
B	4,138,579.00	95.01	1.515	91	98	174.6	48.6	-	N/A
C	1,477,302.00	33.91	1.971	118	98	55.2	17.3	-	N/A
D	1,120,255.00	25.72	0.856	51	98	92.6	13.3	47.75	884.5
E	1,455,632.00	33.42	0.170	10	98	263.1	17.4	44.70	884.5
F	2,955,501.00	67.85	0.170	10	98	534.3	35.4	70.05	884.5
G	818,586.00	18.79	0.170	10	98	148.2	9.8	24.87	884.5
H	1,082,576.00	24.85	0.170	10	98	195.6	12.9	32.80	884.5
I	580,846.00	13.33	0.170	10	98	104.8	6.9	-	N/A
							172.1	220.17	

September 15, 2009 8:55.25 am (mlk)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Basin Delineation.dwg

FLOWLINE
TOP DIKE ELEVATION

DRAINAGE STRUCTURES			
STRUCTURE #	1	2	3
TOP DIKE ELEV.	890	890	890
BOTTOM WIDTH (b)	270	130	100
SIDE SLOPE (m:1)	4	4	4
FLOW LINE	888	883	889

BROAD CRESTED WEIR

NOTE:
BASINS WITH SAFE WATER ELEVATIONS DESIGNATED AS "N/A" INDICATE THE VOLUME OF THE BASIN IS NOT USED TO CALCULATE THE SAFE WATER ELEVATION. BASIN IS ASSUMED TO BE FULL AT THE TIME OF THE RAIN FALL EVENT.

URS 8300 College Blvd., Suite 200 Overland Park, Kansas 66210

CLIENT: KANSAS CITY POWER & LIGHT
LOCATION: LACYGNE, KANSAS
TITLE: BASIN DELINEATION AND SAFE WATER LEVELS - UPPER AQC POND LACYGNE POWER GENERATION STATION

DRAWN BY	CHECKED BY	APPROVED BY
REK	LTB	LTB
PROJECT NO.	DATE	FIGURE NO.
16530488	SEPT. 2009	1

600 East 95th Street
Kansas City Missouri 64131
816 363 3663

Woodward-Clyde Consultants

January 12, 1979
K78-105-1

Mr. Duane G. Jehlik
Division of Water Resources
Kansas State Board of Agriculture
1720 South Topeka Avenue
Topeka, Kansas 66612

SLOPE STABILITY AND HYDROLOGIC DESIGN BASES FOR
NEW FGD SLUDGE RETENTION DAM
LA CYGNE STATION, KANSAS

Dear Mr. Jehlik:

As you requested, we are providing herein a summary of the slope stability and hydrologic design bases which were used in the design of the new FGD sludge retention dam at La Cygne Station.

The dam embankment was designed to have a minimum factor of safety for static slope stability of 1.5 which is consistent with the recommendations contained in the, "Engineering and Design Manual for Coal Refuse Disposal Facilities," published by the U. S. Department of Interior, Mining Enforcement and Safety Administration (MESA). The critical section for the slope stability analysis is a 40 ft high dam embankment section with 2½ horizontal to 1 vertical side slopes and steady state seepage from a reservoir 5 feet below the crest to a 20-foot wide drain located inside the dam on natural ground. Using effective stress shear strength parameters for the embankment material of 20 degrees for the angle of internal friction and 2 psi for the cohesion, we compute a factor of safety in excess of 1.6. Earthquake stability for the dam was investigated by applying a psuedo static horizontal seismic acceleration to the embankment which is consistent with the location of the dam in seismic risk zone 1 (Algermissen, 1969). The computed factor of safety for the previous critical dam section subjected to seismic loading was in excess of 1.4 which is consistent with a recommended minimum factor of safety of 1.2 for seismic loading according to the MESA publication. Since this dam is designed to permanently retain sludge, it was not necessary to consider rapid drawdown conditions for the upstream slope.

The study of the surface water and ground water hydrology related to the development of the proposed sludge retention dam was done under the supervision of Mr. John Halepaska. The diversion ditches were designed for a 25-year, six hour storm. Details of the surface water and ground water study are presented in the draft report which is attached.

Riprap has not been included in the original design for this dam because the proposed operating procedure for the sludge pond consists of slowly filling the pond with spent sludge. For this reason the water level will rise to its maximum level slowly with resulting fetches less than one mile. It is planned that significant erosion or beaching caused by wave action will be stabilized by future maintenance. If localized riprap is required at the dam crest which is unprotected by the sludge then riprap can be applied where required several years in the future at a substantial savings in cost over the complete installation during initial construction.

Please let us know if you have any further questions regarding the subject or if you have comments on other subjects.

Very truly yours,

J. D. Campbell
J. D. Campbell
Associate

D. M. Duncan
D. M. Duncan, P. E.
Vice President

JDC:DMD:baf

Enclosures

cc: R. Cocayne, KCP&L
E. Chubb, KCP&L

APPENDIX B - Additional Pictures

B- 1: Bottom Ash Pond looking west

B- 2: Bottom Ash Pond looking east

B- 3: Bottom Ash Pond looking north

Site Name:	**La Cygne Generating Station**	**Date:**	**21 Sept 2010**
Unit Name:	**Bottom Ash Pond**	**Operator's Name:**	**Kansas City Power and Light**
Unit I.D.:		**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** ☐
	Inspector's Name:	Michael McLaren, Andrew Cueto	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	**X monthly**		18. Sloughing or bulging on slopes?		**X**
2. Pool elevation (operator records)?	**X**		19. Major erosion or slope deterioration?		**X**
3. Decant inlet elevation (operator records)?	**X**		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	**N/A**		Is water entering inlet, but not exiting outlet?		**X**
5. Lowest dam crest elevation (operator records)?	**852.5'**		Is water exiting outlet, but not entering inlet?		**X**
6. If instrumentation is present, are readings recorded (operator records)?		**N/A**	Is water exiting outlet flowing clear?	**X**	
7. Is the embankment currently under construction?		**X**	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		**N/A**	From underdrain?		**X**
9. Trees growing on embankment? (If so, indicate largest diameter below)		**X**	At isolated points on embankment slopes?		**X**
10. Cracks or scarps on crest?		**X**	At natural hillside in the embankment area?		**X**
11. Is there significant settlement along the crest?		**X**	Over widespread areas?		**X**
12. Are decant trashracks clear and in place?		**N/A**	From downstream foundation area?		**X**
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		**X**	"Boils" beneath stream or ponded water?		**X**
14. Clogged spillways, groin or diversion ditches?		**X**	Around the outside of the decant pipe?		**X**
15. Are spillway or ditch linings deteriorated?		**N/A**	22. Surface movements in valley bottom or on hillside?		**X**
16. Are outlets of decant or underdrains blocked?		**X**	23. Water against downstream toe?		**X**
17. Cracks or scarps on slopes?		**X**	24. Were Photos taken during the dam inspection?	**X**	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
1	Pond is incised into ground. No Hazard Potential Assessment.
2	
3	
4	

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit 1-MC18-PO01 **INSPECTOR** Michael McLaren, Andrew Cueto

Date 21 Sept 2010
Impoundment Name Bottom Ash Pond

Impoundment Company Kansas City Power and Light
EPA Region Region 7

State Agency (Field Office) Address Kansas Department of Health and Environment
Name of Impoundment La Cygne Generating Station Bottom Ash Pond

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☒ **Update** ☐

	Yes	No
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☒	☐

IMPOUNDMENT FUNCTION: Settling Basin for Bottom Ash waste

Nearest Downstream Town Name: Osceola, MO

Distance from the impoundment:

Location:

Longitude	38	**DEG**	20	**MIN**	59.88	**SEC**	**W**
Latitude	94	**DEG**	38	**MIN**	48.16	**SEC**	**N**

State KS **County** LINN

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Kansas Department of Health and Environment

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

N/A **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☐ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

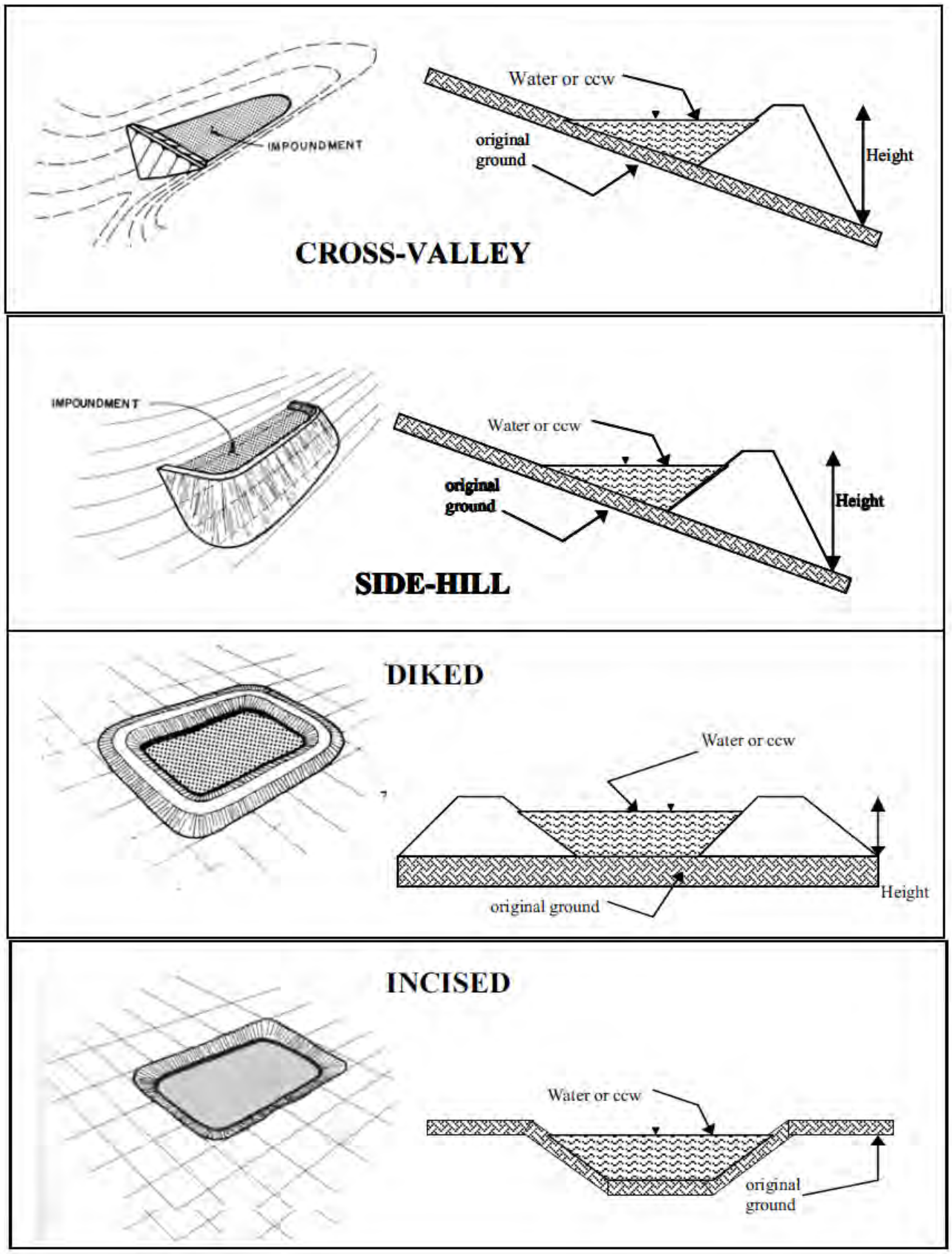
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Pond is incised into ground. No potential for breach and spilling.

CONFIGURATION:



☐ Cross-Valley ☐ Side-Hill ☐ Diked

☒ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft)	n/a	**Embankment Material**	n/a
Pool Area (ac)	1.7	**Liner**	clay
Current Freeboard (ft)	3+	**Liner Permeability**	$<10^{-7}$

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

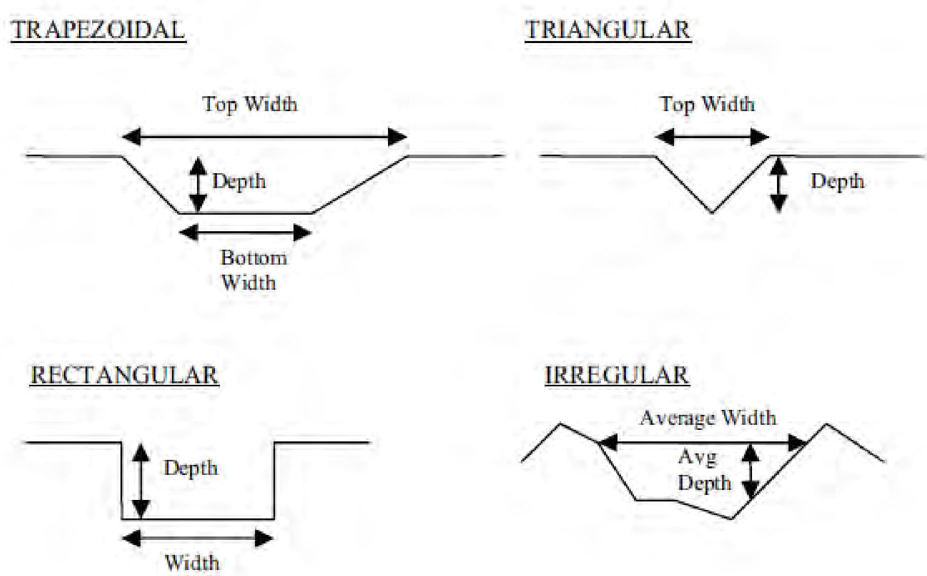
☐ Rectangular

☐ Irregular

depth (ft)

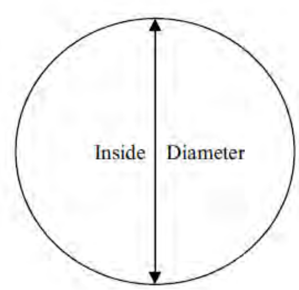
average bottom width (ft)

top width (ft)



☒ **Outlet**

24” inside diameter



Material

☐ corrugated metal

☐ welded steel

☒ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☐	☒

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By **KCPL staff – not a P.E**

	Yes	No
Has there ever been a failure at this site?	☐	☒

If So When?

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

Pond is incised.

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

n/a– incised pond

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

n/a – no foundation – incised pond

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

n/a– incised pond

Site Name:	**La Cygne Generating Station**	Date:	**21 Sept 2010**
Unit Name:	**Lower AQC Pond**	Operator's Name:	**Kansas City Power and Light**
Unit I.D.:		Hazard Potential Classification:	**High** ☐ **Significant** ☐ **Low** ☒
	Inspector's Name:	Michael McLaren, Andrew Cueto	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X monthly		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	X		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	861'		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	864'		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
1	
2	
3	
4	

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit n/a **INSPECTOR** Michael McLaren, Andrew Cueto

Date 21 Sept 2010
Impoundment Name Lower AQC Pond

Impoundment Company Kansas City Power and Light
EPA Region Region 7

State Agency (Field Office) Address Kansas Department of Health and Environment
Name of Impoundment La Cygne Generating Station Lower AQC Pond

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☒ **Update** ☐

	Yes	No
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☒	☐

IMPOUNDMENT FUNCTION: Water storage

Nearest Downstream Town Name: Osceola, MO

Distance from the impoundment:

Location:

Longitude	38	**DEG**	21	**MIN**	22.57	**SEC**	**W**
Latitude	94	**DEG**	38	**MIN**	18.20	**SEC**	**N**

State KS **County** LINN

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Kansas Department of Health and Environment

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☒ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

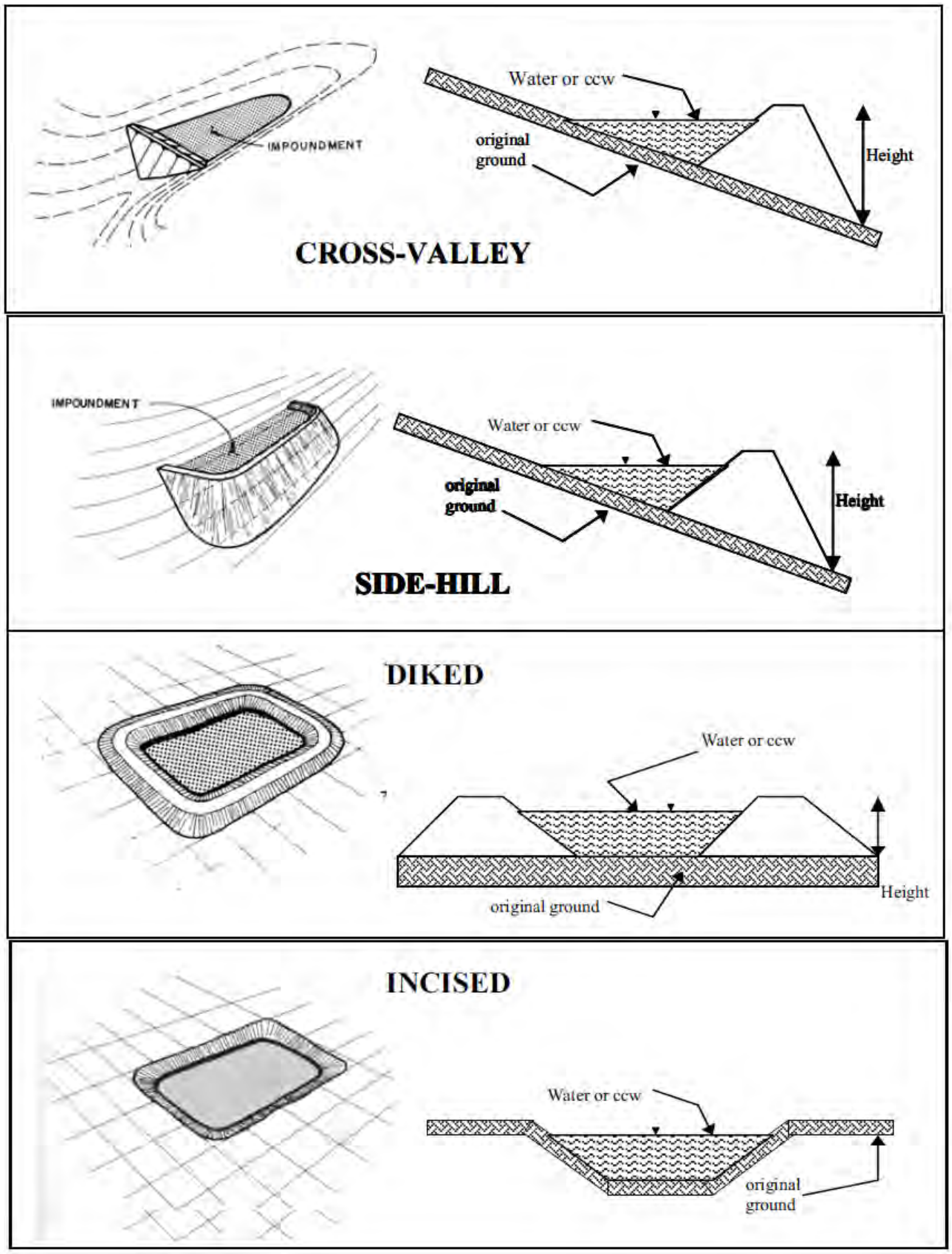
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Pond would spill into La Cygne Generating Station Cooling Water lake and be contained within the lake storage. There would be little to no environmental damage and it would be contained on KCPL property.

CONFIGURATION:



- [ ] Cross-Valley
- [x] Side-Hill
- [ ] Diked
- [ ] Incised (form completion optional)
- [ ] Combination Incised/Diked

Embankment Height (ft) 24

Pool Area (ac) 163

Current Freeboard (ft) 3+

Embankment Material Native clay

Liner clay

Liner Permeability $<10^{-7}$

TYPE OF OUTLET (Mark all that apply)

☒ **Open Channel Spillway**

☒ Trapezoidal

☐ Triangular

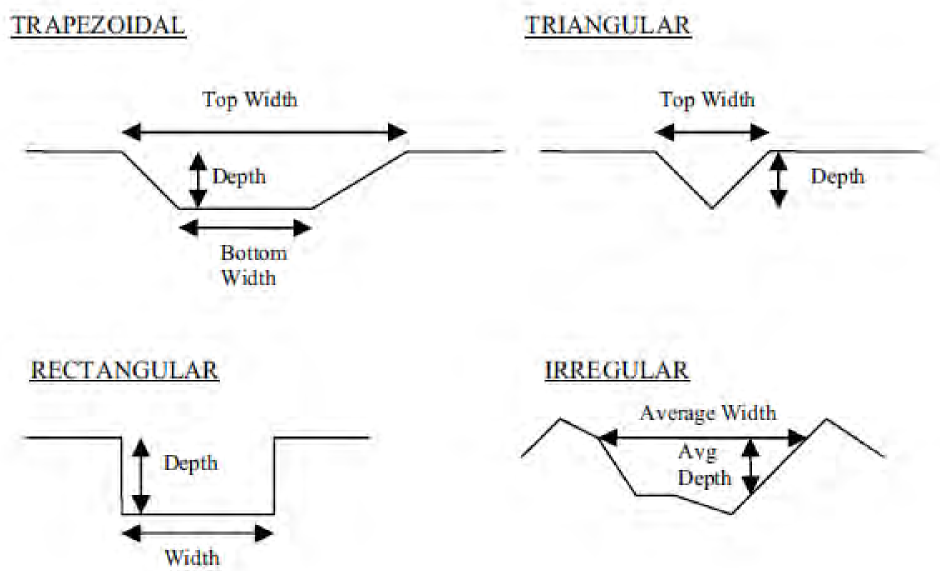
☐ Rectangular

☐ Irregular

2 depth (ft)

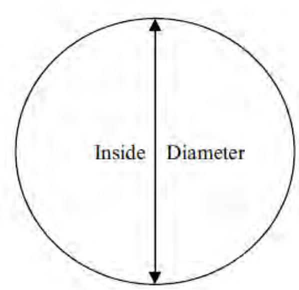
160 average bottom width (ft)

176 top width (ft)



☐ **Outlet**

inside diameter



Material

☐ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☐	☒

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By **Black and Veatch – designed by a P.E.**

	Yes	No
Has there ever been a failure at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No. Pond embankment was structurally designed and keyed into native soils that were cleared and grubbed.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Drawings were provided from Engineer-of-Record.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No.

Site Name:	**La Cygne Generating Station**	Date:	**21 Sept 2010**
Unit Name:	**Upper AQC Pond**	Operator's Name:	**Kansas City Power and Light**
Unit I.D.:		Hazard Potential Classification:	**High** ☐ **Significant** ☐ **Low** ☒
	Inspector's Name:	Michael McLaren, Andrew Cueto	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unus ual c onditions or construction pr actices t hat s hould b e not ed i n t he comments section. F or l arge diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	X monthly		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	X		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	n/a		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	890’		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)	X 1.0”-1.5” Saltceder (Tamarix Aphylla)		At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
1	
2	
3	
4	

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit n/a **INSPECTOR** Michael McLaren, Andrew Cueto

Date 21 Sept 2010
Impoundment Name Upper AQC Pond

Impoundment Company Kansas City Power and Light
EPA Region Region 7

State Agency (Field Office) Address Kansas Department of Health and Environment
Name of Impoundment La Cygne Generating Station Lower AQC Pond

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☒ **Update** ☐

	Yes	No
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☒	☐

IMPOUNDMENT FUNCTION: Settling Pond

Nearest Downstream Town Name: Osceola, MO

Distance from the impoundment:

Location:

Longitude	38	**DEG**	22	**MIN**	10.65	**SEC**	**W**
Latitude	94	**DEG**	38	**MIN**	02.13	**SEC**	**N**

State KS **County** LINN

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Kansas Department of Health and Environment

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☒ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

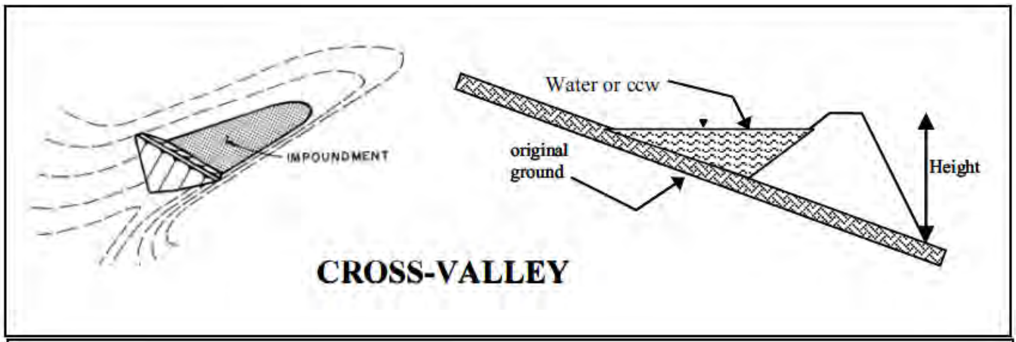
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

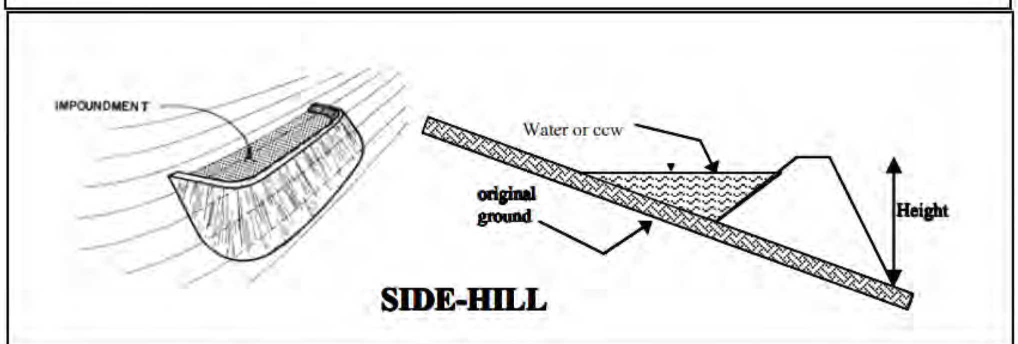
☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

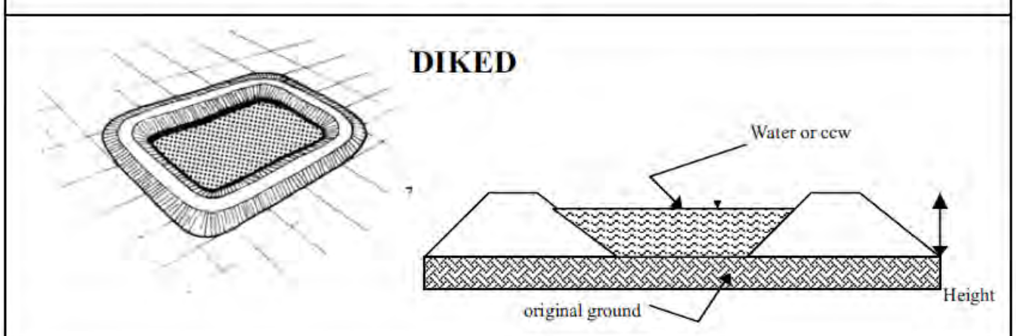
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

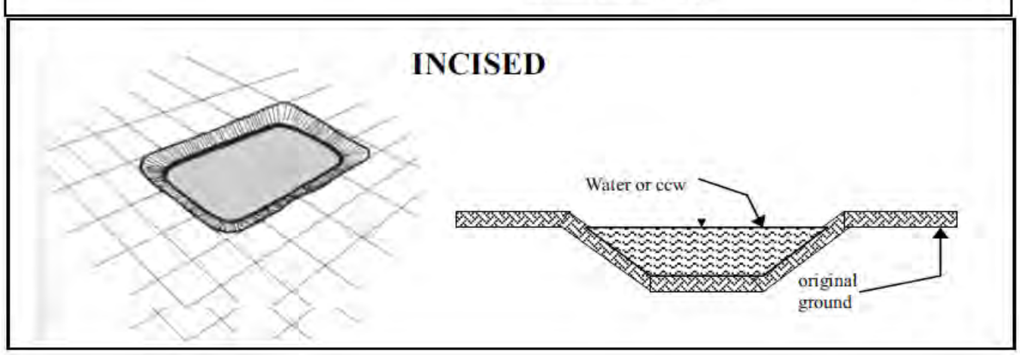
Pond would spill into La Cygne Generating Station Cooling Water lake and be contained within the lake storage. There would be little to no environmental damage and it would be contained on KCPL property.

CONFIGURATION:









☐ Cross-Valley ☐ Side-Hill ☒ Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft)	45	**Embankment Material**	Native clay
Pool Area (ac)	332	**Liner**	clay
Current Freeboard (ft)	3+	**Liner Permeability**	$<10^{-7}$

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

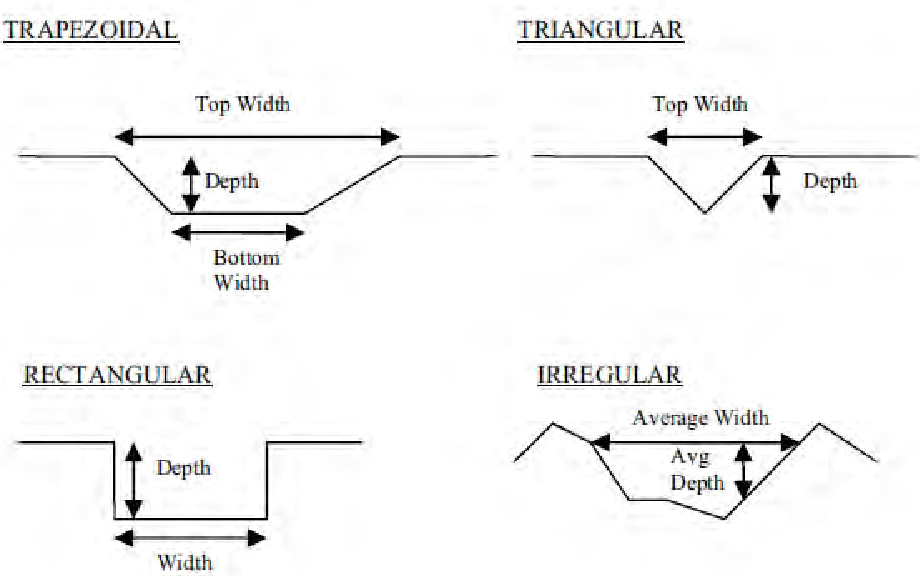
☐ Rectangular

☐ Irregular

depth (ft)

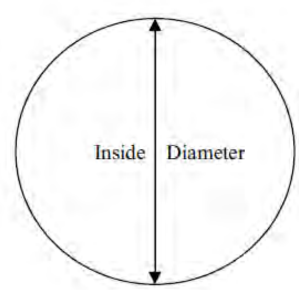
average bottom width (ft)

top width (ft)



☒ **Outlet**

48” sharp crested weir



Material

☐ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☐	☒

☐ **No Outlet**

☒ **Other Type of Outlet** (specify):

The Impoundment was Designed By **Black and Veatch – designed by a P.E.**

	Yes	No
Has there ever been a failure at this site?	☐	☒

If So When?

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	☒
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	☒
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

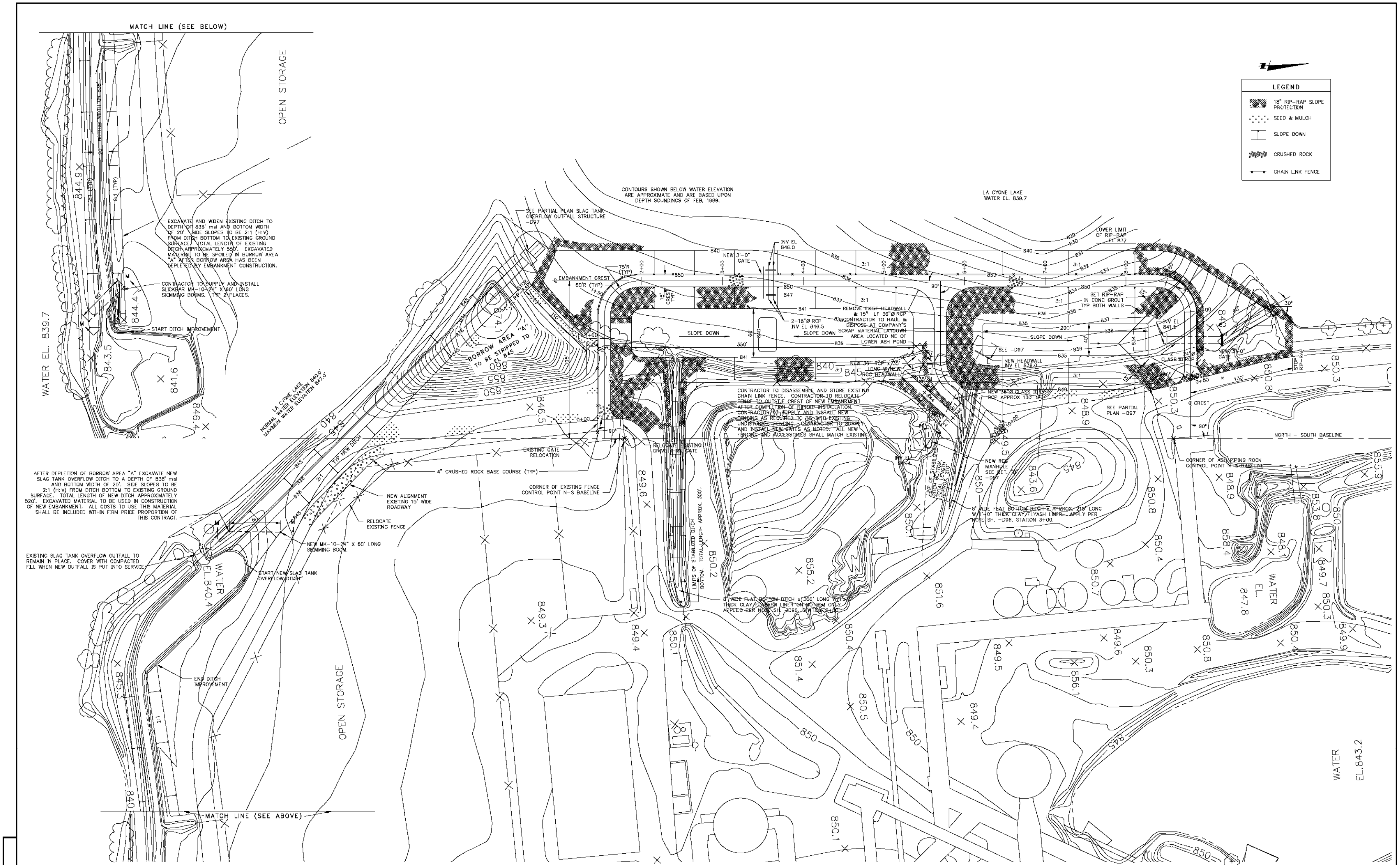
No. Pond embankment was structurally designed and keyed into native soils that were cleared and grubbed.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Drawings were provided from Engineer-of-Record.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No.



DWG. NO.	REFERENCE DRAWINGS	REV	REV. DATE	REVISION & JOB NO.	BY	CK.	APP.
		1	02-APR-90	ISSUED FOR BID	LSB		

APPROVED	DATE

DRAWN	DATE	ENGR. CK.	DATE
LSB	08-JAN-90		
DRAFT.	DATE	SCALE	
HLM	06-MAR-90	1in=50ft	
		JOB NO.	

LA CYGNE STATION

WEST SIDE OUTFALL MODIFICATIONS

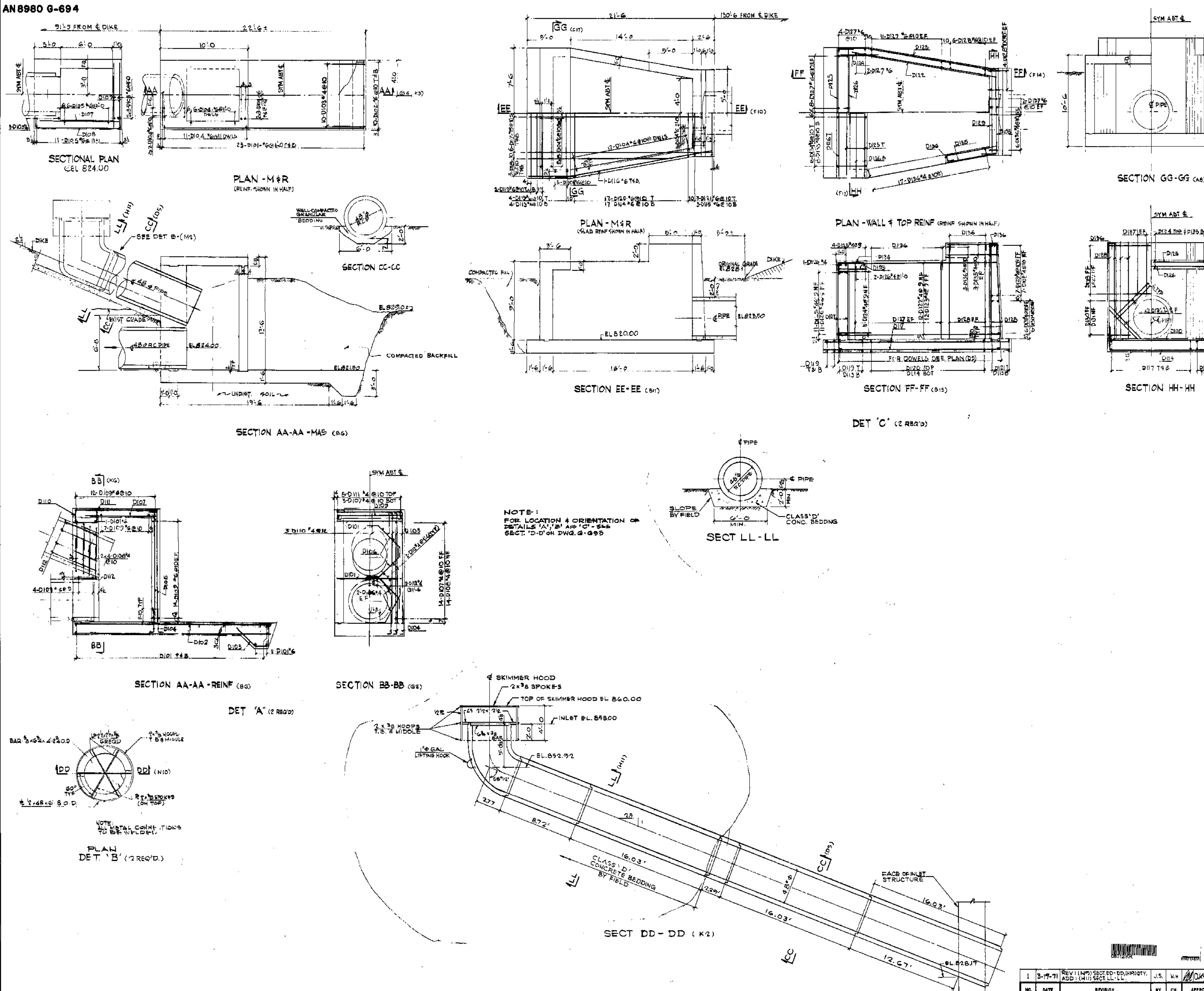
GRADING PLAN

K. C. POWER & LIGHT CO.

ENGINEERING DEPT

DWG. NO. KC/200/80/D95

AN 8980 G-694



QUANTITIES (NET, BY FIELD U.N.)

FOR REINF STL SEE BAR BENDING SCHEDULE B-541-16	
CONC. CLASS "B" (3000 PSI)	136 CU.YDS
SKIMMER HOOD AS PER DET B (M1)	2 REQ'D
48"Φ R.C. CYLINDER PIPE:	
STD. LGTH STR. PIPE (L.L. - 16.03')	16 REQ'D
SHORT LGTH STR. PIPE (L.L. - 2.29')	2 REQ'D
68°12' ELBOW (S=2.77', B=5.08')	2 REQ'D
SHORT LGTH STR. PIPE (L.L. - 8.72')	2 REQ'D

NOTES (NET BY FIELD UNLESS NOTED)

CONCRETE SHALL BE CLASS "B" (3000 PSI)
SEE SPECIFICATION EBASCO 14-65 CONCRETE MASONRY

ALL ANCHOR BOLTS, DRAIN PIPES, PIPE SLEEVES, ELECTRICAL CONDUITS AND EMBEDDED PARTS SHALL BE IN POSITION BEFORE CONCRETE IS PLACED.

FOR SPECIFICATIONS FOR STEEL FOR CONCRETE REINFORCING BARS AND FOR BAR DETAILS SEE BAR BENDING SCHEDULE.

PLACING DIMENSIONS ARE GIVEN TO CENTER OF BARS UNLESS NOTED.

ALL SPLICES IN REINFORCEMENT SHALL COMPLY WITH THE REQUIREMENTS OF CURRENT ACI STANDARDS, SECTION 805, BUT IN NO CASE SHALL LAP BE LESS THAN 24 BAR DIAMETERS.

ALL BARS SHALL HAVE 2" MINIMUM CONCRETE COVER UNLESS OTHERWISE NOTED.

SHIFT OR BEND BARS TO CLEAR ANCHOR BOLTS, DRAINS, PIPE SLEEVES AND EMBEDDED PARTS.

PIPE LAID ON SLOPE OF DIKE SHALL BE R.C. CYLINDER PIPE WITH RUBBER & STEEL JT. STR. PIPE SHALL BE INTERPACE SP-12 HEAVY CONE - SPEC. AWWA C301 OR EQUAL. ELBOWS SHALL BE INTERPACE SP-1 TYPE 'A' - SPEC. AWWA C-302 OR EQUAL.

REFERENCE DRAWINGS — AN 8980-

LIST OF DRAWINGS	A-160
ASH POND DIKE PLAN & SECT	G-675
BAR BENDING SCHEDULE	B-541-16

5946

WORK THIS DRAWING WITH DWG G-693

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
1973-846 MW (NET) INSTALLATION - UNIT NO. 1

ASH POND DIKE DETS - MAS & REINF

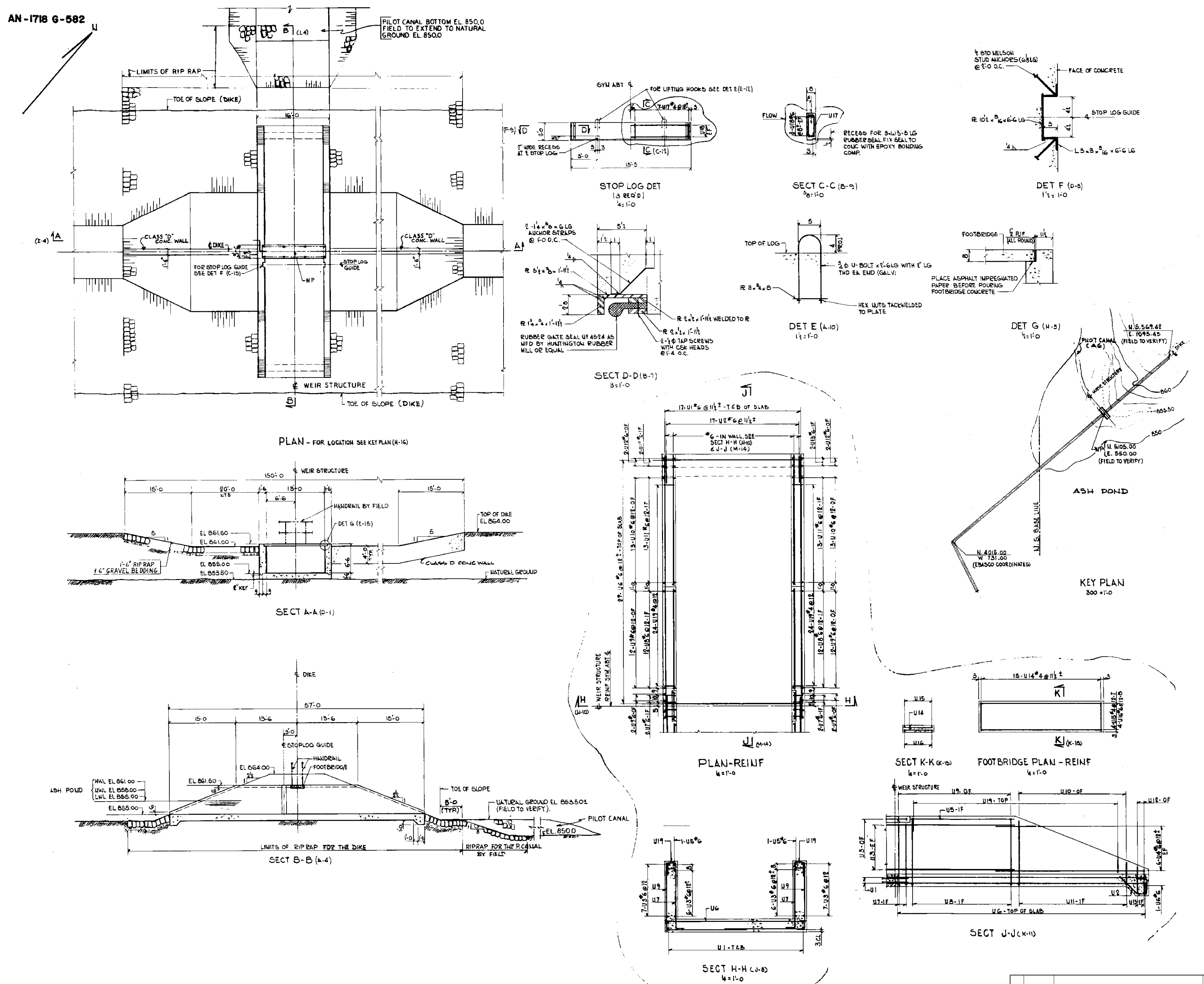
EBASCO SERVICES INCORPORATED NEW YORK

NO.	DATE	REVISION	BY	CH.	APPROVED
1	3-19-71	REV: (N9) SECT. DD-DD, (H19) QTY. ADD: (H11) SECT. LL-LL	J.S.	W.H.	

SCALE 1/4"=1'-0 | APPROVED | DATE
DIV. C-H
DR. Schneider
CH. PATEL

AN 8980
G-694

AN-1718 G-582



QUANTITIES (NET BY FIELD, UNLESS NOTED)

CONCRETE CLASS 'B' (3000 PSI)	86 CU YD
FOR REINF STEEL SEE BAR BENDING SCHEDULE	B-538-20
RIP-RAP	560 CU YD
GRAVEL	200 CU YD
STOP LOGS AS PER DETAIL (C-9)	3 REQ'D
STOP LOG GUIDES AS PER DETAIL F (C-15)	2 REQ'D
HANDRAIL	BY FIELD
½" PREMOLDED JOINT FILLER	5 SQ.FT.
CONCRETE CLASS 'D' (2000 PSI)	30 CU. YD.

NOTES

CURRENT ACI STANDARDS SHALL GOVERN FOR ALL DESIGN AND CONSTRUCTION UNLESS OTHERWISE NOTED.

CONCRETE SHALL BE CLASS 'B' (3000 PSI) & CLASS 'D' (2000 PSI) SEE SPECIFICATION EBASCO 14-65 CONC-MAS

ALL ANCHOR BOLTS, DRAIN PIPES, PIPE SLEEVES, ELECTRICAL CONDUITS AND EMBEDDED PARTS SHALL BE IN POSITION BEFORE CONCRETE IS PLACED.

FOR SPECIFICATIONS FOR STEEL FOR CONCRETE REINFORCING BARS AND FOR BAR DETAILS SEE BAR BENDING SCHEDULE B-538-20

PLACING DIMENSIONS ARE GIVEN TO CENTER OF BARS UNLESS NOTED.

ALL SPLICES IN REINFORCEMENT SHALL COMPLY WITH THE REQUIREMENTS OF CURRENT ACI STANDARDS, SECTION 805, BUT IN NO CASE SHALL LAP BE LESS THAN 24 BAR DIAMETERS.

ALL BARS SHALL HAVE 2" MINIMUM CONCRETE COVER UNLESS OTHERWISE NOTED.

SHIFT OR BEND BARS TO CLEAR ANCHOR BOLTS, DRAINS PIPE SLEEVES AND EMBEDDED PARTS.

ALL EXPOSED STEEL TO BE HOT DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASA SPEC G8.1 (ASTM A 123)

ALL MATERIAL FOR STOP LOGS TO BE FURNISHED BY FIELD

BACKFILL TO BE SELECT MATERIAL THOROUGHLY COMPACTED TO 95% STD PROCTOR DENSITY. FOR THE WEIR STR.

WEIR STRUCTURE, LESS STOPLOGS, DESIGNED FOR 100 YEAR FLOOD CONDITION (210 CFS)

DEPRESSED SECTION DESIGNED FOR MAXIMUM PROBABLE FLOOD CONDITION (1303 CFS)

NORMAL OPERATING CONDITION - 2 STOPLOGS IN PLACE

REFERENCE DRAWINGS

LIST OF DRAWINGS	A-537
BAR BENDING SCHEDULE	B-538-20
ASH POND DIKE - PLAN & SECTIONS	8980-G-693

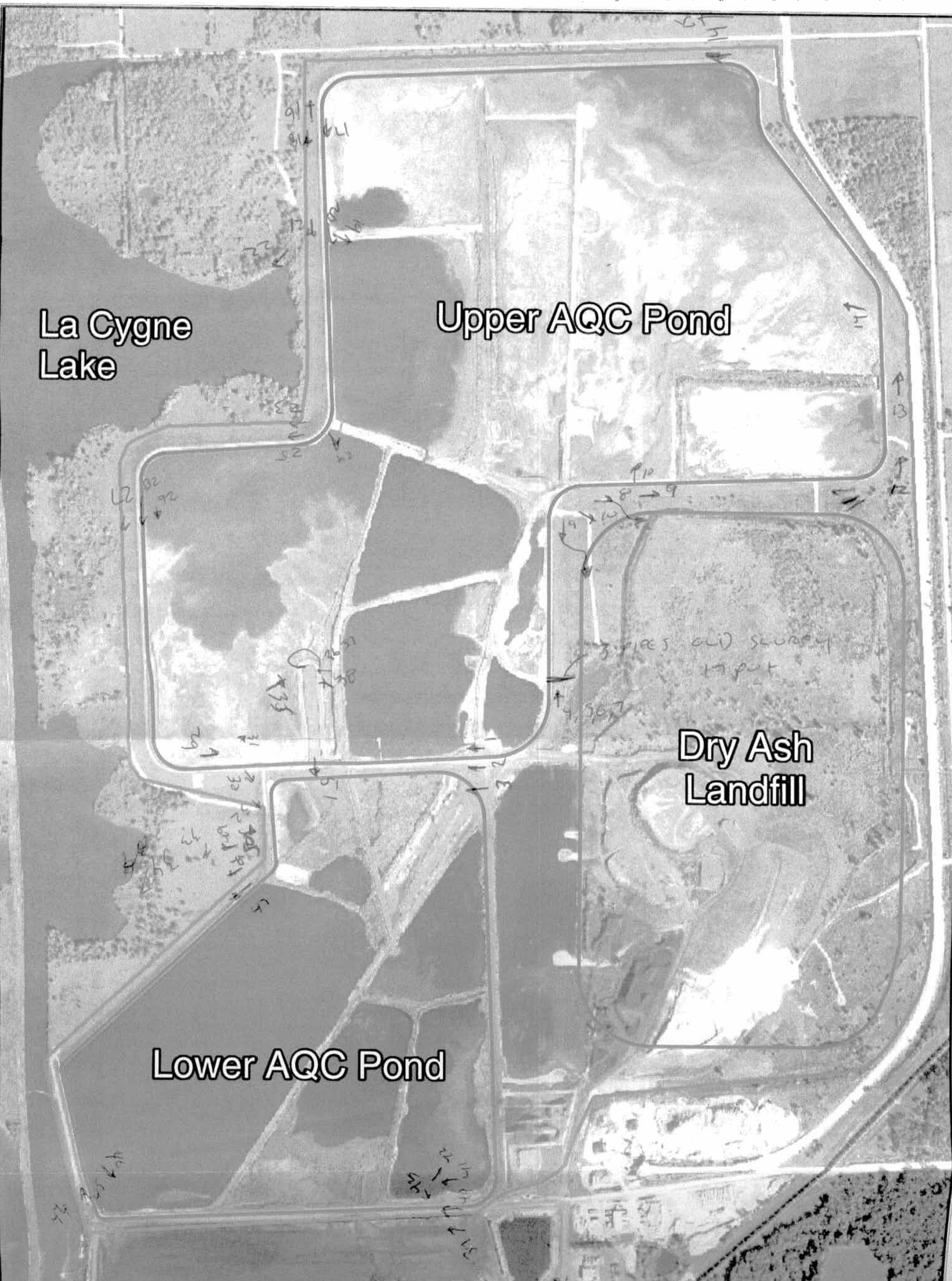
LA CYGNE STATION
AIR QUALITY CONTROL
AQC STRUCTURAL
MISCELLANEOUS ASH POND WEIR STRUCTURE M&R
DIAGRAM

DRAWN ESI DATE 12/28/71	APPROVED ESI DATE 12/28/71
DRAFT. CK. DATE	SCALE
ENGR. CK. DATE	JOB NO. 1718

KANSAS CITY
POWER & LIGHT COMPANY

DWG. NO. 1718 G582

File: K:\16529832_KCPL_Permit\Aerial Photo.mxd, March 29, 2004



Legend

AQC Ponds and Dry Ash Landfill Outline

Extent of Solid Waste Disposal Areas

Note: Aerial Photographs collected December 2003 by M.J. Harden Associates, Inc.

1 inch equals 600 feet

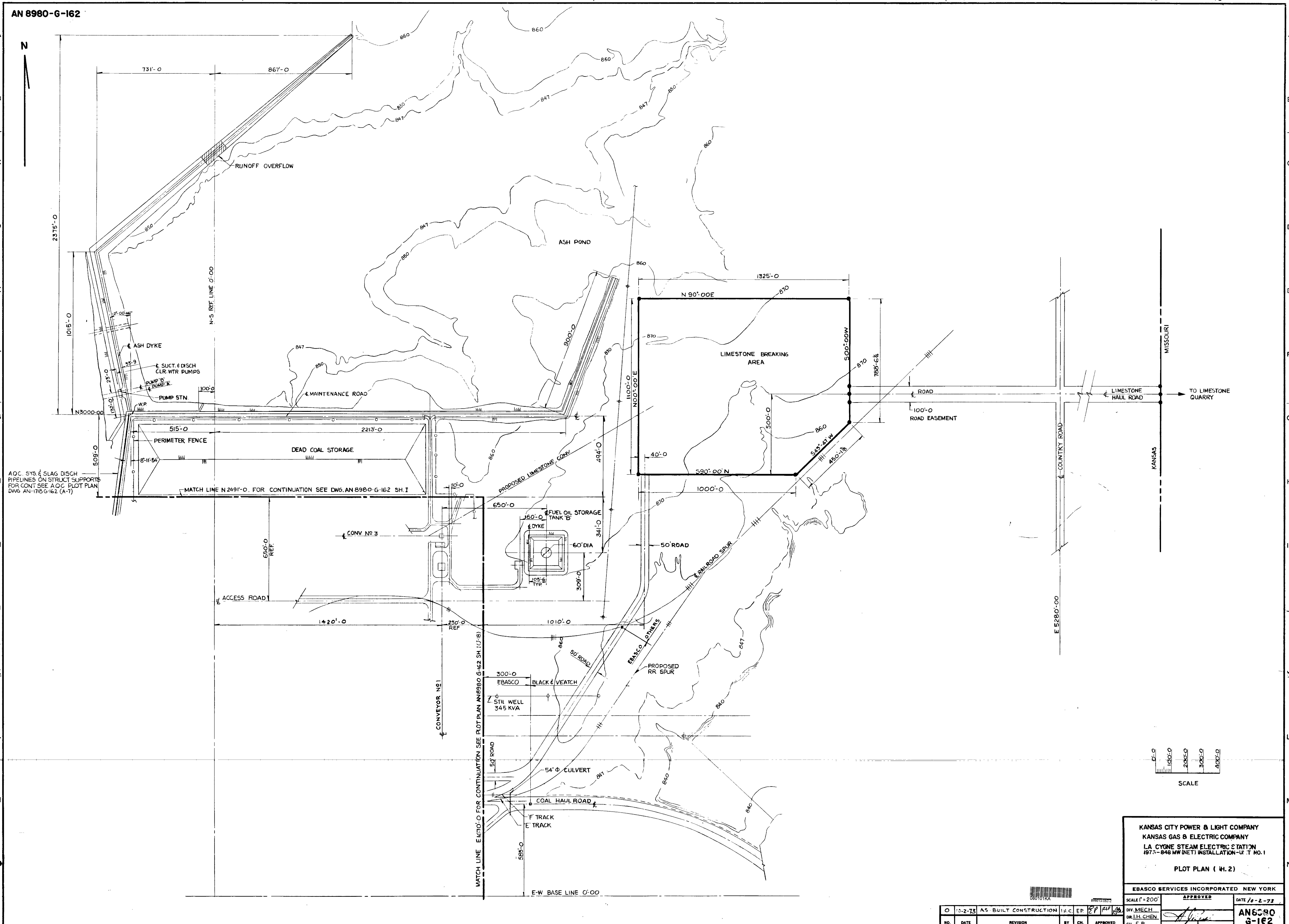
0 150 300 600 900 1,200 Feet

URS 10975 El Monte, Suite 100
Overland Park, KS 66211

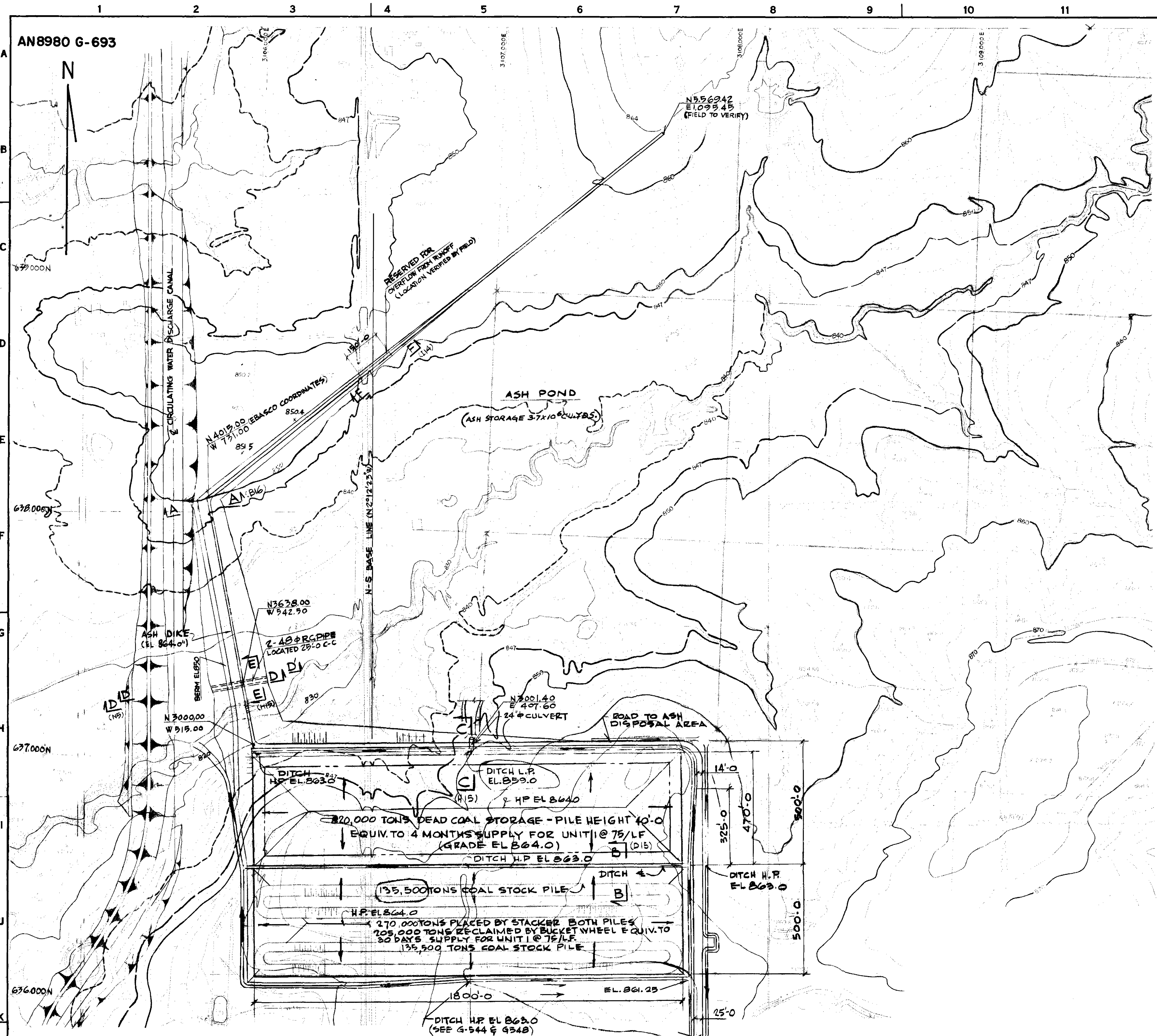
SITE: La Cygne Generating Station
La Cygne, Kansas

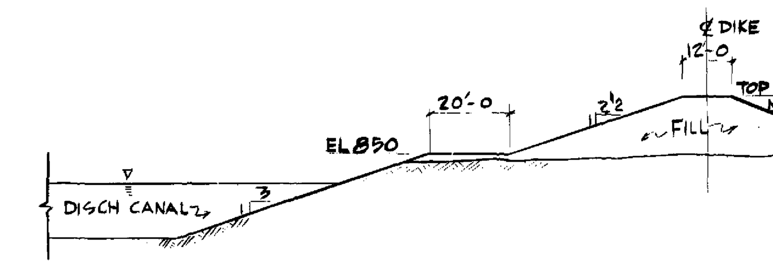
DESCRIPTION: Site Aerial Photograph

DRAWN BY	CHECKED BY	APPROVED BY
BAF	KJD	BDL
PROJECT #	DATE	FIGURE NO
16529832	March 29, 2004	3

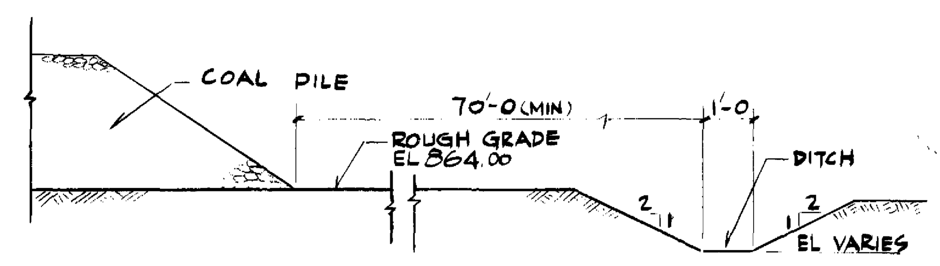

AN 8980-G-162
N
731'-0
867'-0
2375'-0
RUNOFF OVERFLOW
N-S REF. LINE 0'-00
ASH POND
1015'-0
℄ ASH DYKE
℄ SUCT. & DISCH CLR. WTR PUMPS
PUMP 'B'
PUMP 'A'
PUMP STN.
100'-0
℄ MAINTENANCE ROAD
N3000-00
900'-0
1100'-0
N00°-00'E
1325'-0
N 90°-00E
LIMESTONE BREAKING AREA
S00°-00W
788'-6¼
500'-0
40'-0
S90°-00'N
S45°-47'W
450'-1⅛
℄ ROAD
100'-0 ROAD EASEMENT
℄ LIMESTONE HAUL ROAD
TO LIMESTONE QUARRY
MISSOURI
KANSAS
℄ COUNTRY ROAD
E 5280'-00
515'-0
2213'-0
PERIMETER FENCE
DEAD COAL STORAGE
509'-0
494'-0
PROPOSED LIMESTONE CONV
A.O.C. SYS. & SLAG DISCH PIPELINES ON STRUCT SUPPORTS FOR CONT SEE A.O.C. PLOT PLAN DWG AN-1718 G-162 (A-7)
MATCH LINE N 2491'-0, FOR CONTINUATION SEE DWG. AN 8980-G-162 SH. I
1000'-0
650'-0
160'-0
℄ FUEL OIL STORAGE TANK 'B'
℄ DYKE
341'-0
60' DIA
50' ROAD
℄ CONV No 3
650'-0 REF.
309'-0
105'-6 TYP
℄ RAILROAD SPUR
℄ ACCESS ROAD
1420'-0
250'-0 REF
1010'-0
50' ROAD
EBASCO
OTHERS
PROPOSED RR SPUR
300'-0
EBASCO
BLACK & VEATCH
STIL WELL 345 KVA
CONVEYOR No 1
MATCH LINE E 1670'-0 FOR CONTINUATION SEE PLOT PLAN AN 8980 G-162 SH (I-7-18)
50' ROAD
54" Φ CULVERT
COAL HAUL ROAD
'F' TRACK
'E' TRACK
585'-0
E-W BASE LINE 0'-00
SCALE
KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS & ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
1973-848 MW (NET) INSTALLATION-UNIT NO. 1
PLOT PLAN (SH. 2)
EBASCO SERVICES INCORPORATED NEW YORK
SCALE 1" = 200'
APPROVED
DATE 10-2-73
DIV. MECH
DR. I.H. CHEN
CH. E.P.
AN8980 G-162
0 | 10-2-73 | AS BUILT CONSTRUCTION | I.H.C. | E.P.
NO. | DATE | REVISION | BY | CH. | APPROVED
080101KA
8980 G-162-2

AN8980 G-693

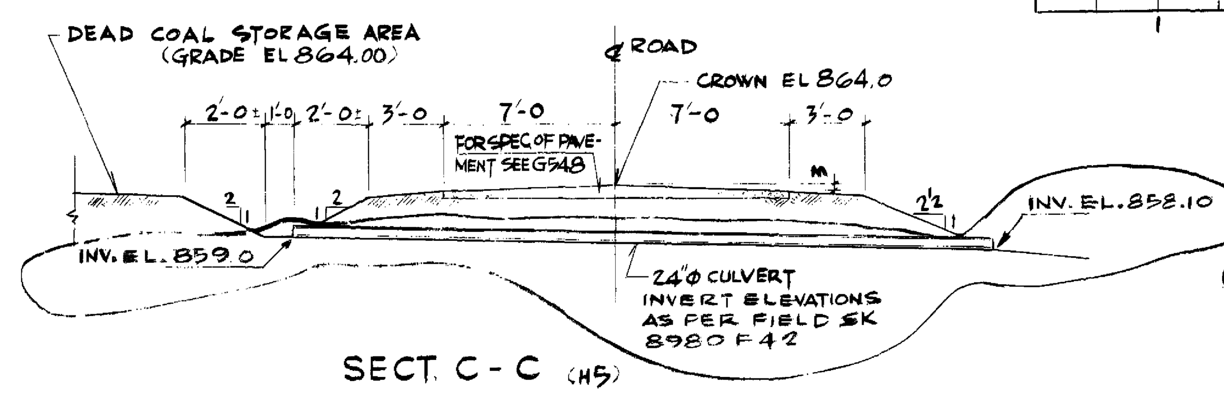




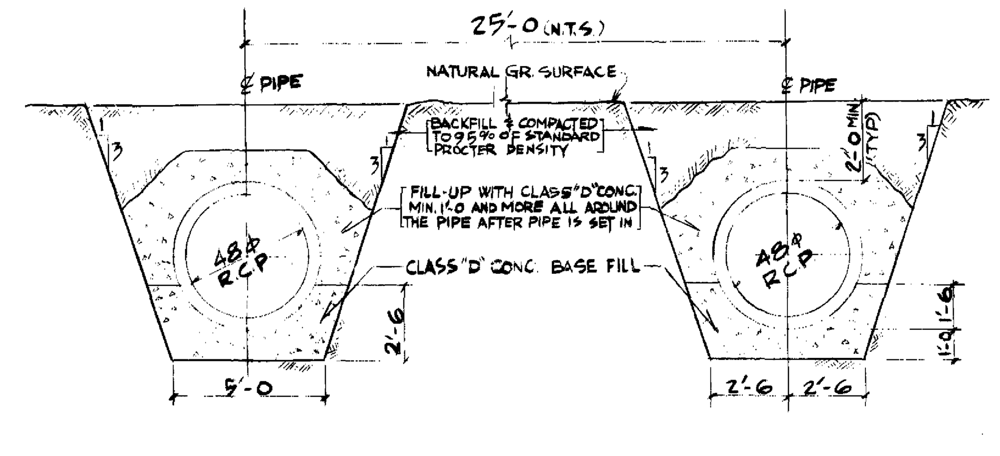
SECT. A-A (E2)
1" = 30'-0



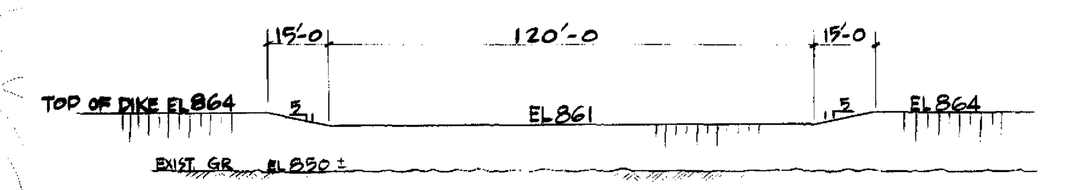
SECT. B-B (I7)
N.T.S.



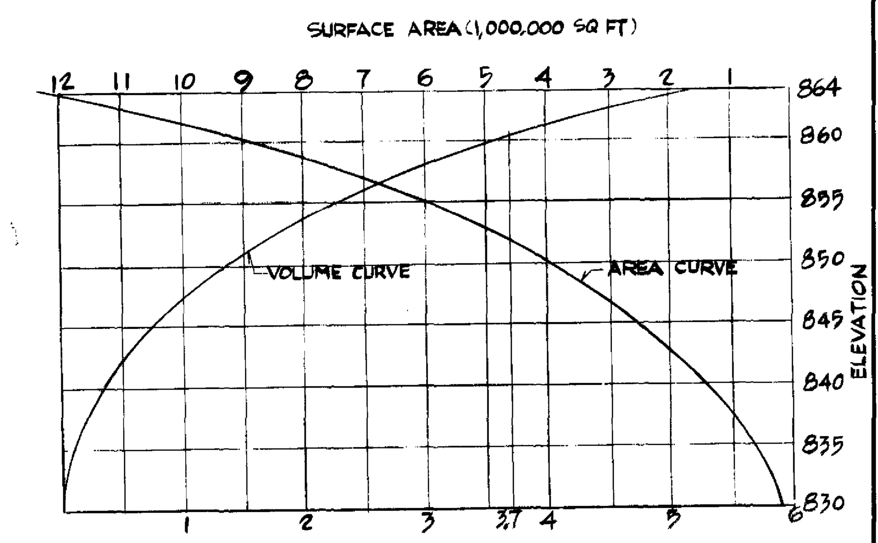
SECT. C-C (H5)
N.T.S.



SECT. E-E (G2)
¼" = 1'-0



ELEVATION F-F (D4)
1" = 30'-0



APPROX STORAGE
(VOLUME OF DIKE FILL NOT INCLUDED)

QUANTITIES (NET, BY FIELD UNLESS NOTED)

AREA	EXCAVATION	FILL
ASH DISPOSAL AREA DIKE		115,100 CU. YDS

FILL QTY'S EXCLUDE FILLING OF REMOVED UNSUITABLE MATERIAL UNDERNEATH DIKE AND 10% SHRINKAGE.

MAX. ASH STORAGE VOLUME 3.7×10^6 CU YDS
24"Φ CULVERT — 30 LIN FT
48"Φ R.C. PIPE — 470 LIN FT (VERIFIED BY FIELD)
PAVING MATERIALS (ASPHALT & CRUSHED STONE) BY FIELD

NOTES

FILL MATERIAL IN THIS DIKE SHALL BE COMPACTED TO 95% OF STANDARD PROCTER DENSITY. THE MOISTURE CONTENT OF THE BACKFILL SHALL BE WITHIN THE LIMITS OF THE OPTIMUM MOISTURE REQUIRED TO OBTAIN THE PERCENT COMPACTION REQUIRED. ADDITIONAL REQUIREMENTS FOR THE FILL ARE NOTED IN PARAGRAPH D9 OF THE GRADING AND DRAINAGE SPECIFICATIONS FOR CONTRACT LA C1. DENSITY TESTS OF THE COMPACTED FILL SHALL BE PERFORMED FOR EVERY 30,000 SQUARE FEET PER 6 INCH LIFT WITH A MINIMUM OF ONE TEST PER DAY FOR THE DIKE SECTION ADJACENT TO THE DISCHARGE CANAL. THE FILL MATERIAL FOR THE NORTH DIKE SECTION FROM CENTERLINE COORDINATES EAST 3,105,832 AND NORTH 638,100 TO THE EAST WILL BE TESTED ONCE FOR EVERY 100,000 SQUARE FEET PER LIFT WITH A MINIMUM OF ONE TEST PER DAY.

THE VOLUME OF STORAGE 3.7 MILLION CUBIC YARDS COVERS A DISPOSAL AREA OF APPROXIMATELY 160 ACRES AND PROVIDES 3 YEARS OF ASH STORAGE FOR UNIT NO. 1 AT MAXIMUM GUARANTEED LOAD AND BURNING A COAL HAVING A 24% ASH CONTENT.

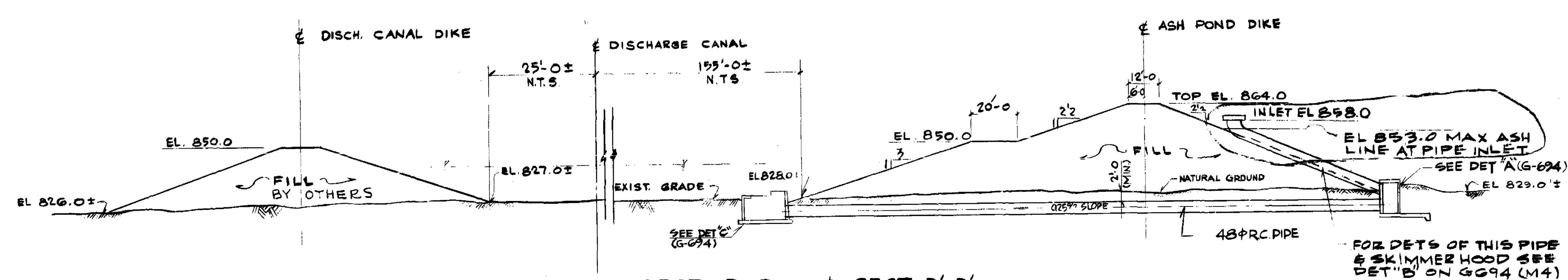
THE QUANTITY OF WATER TO BE DISCHARGED TO ASH POND WILL BE FROM THE FOLLOWING SOURCES:

1. 10,000 gpm FROM THE ASH SLUICE PUMPS.
2. 15,000 gpm (MAXIMUM) FROM THE SO_2 SYSTEM PUMPS.
3. RAINFALL RUN-OFF FROM THE DRAINAGE AREA CONFINED WITHIN THE LIMITS OF THE ASH POND.*

* RUN-OFF VALUES OBTAINED FROM THE DATA PREPARED BY OTHERS.

THE 48"Φ R.C. PIPES USED FOR DRAINING ABOVE QUANTITIES OF WATER UNDER THE EMBANKMENT SHALL BE IN ACCORDANCE WITH SPECIFICATION ASTM C76-64T AND SHALL BE CLASS III PIPE WITH A CLASS "A" BEDDING.

FOR DETAILS AND REINF. STEEL OF THE INLET AND OUTLET STRUCTURES OF THE DRAINAGE PIPE LINES SEE DWG AN8980 G694. AND BAR BENDING SCHEDULE B541-16.



SECT D-D (G1) & SECT D'-D' (G1)
1" = 30'-0

REFERENCE DRAWINGS

LIST OF DRAWINGS	AN8980-A-160
PLAN AREA GRADING AND DRAINAGE PLAN	AN8980-G-545
ASH POND DIKE DETS M & R	AN8980-G-694
PLANT SITE GRADING & DRAINAGE	AN8980-G-544
PLANT ROADS & RAILROAD SECT & PROFILE	AN8980-G-548
DRAINAGE COAL STORAGE AREA (FIELD SKETCH)	AN8980 F-42

NO.	DATE	REVISION	BY	CH.	APPROVED
2	3-22-71	ADDED (K12) DITCH (M18) REF DWG REV (M3) EL OF PIPE & SKIMMER (F15) EL (F15) INVERT EL	ST	W.H.	O.K.
1		ADDED (M3) NOTE & EL	AL	DP	O.K.

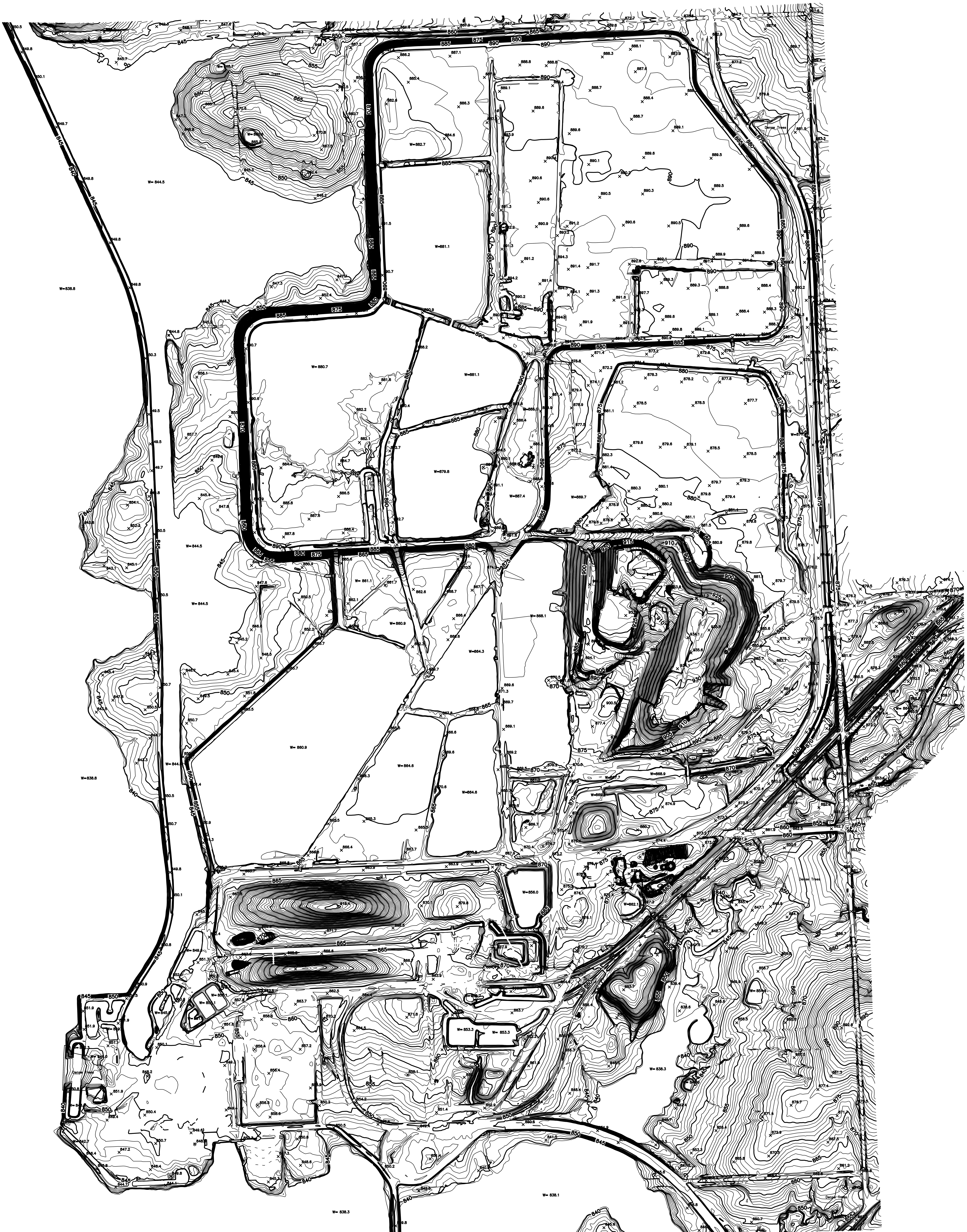
KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
1973-848 MW (NET) INSTALLATION - UNIT NO. 1

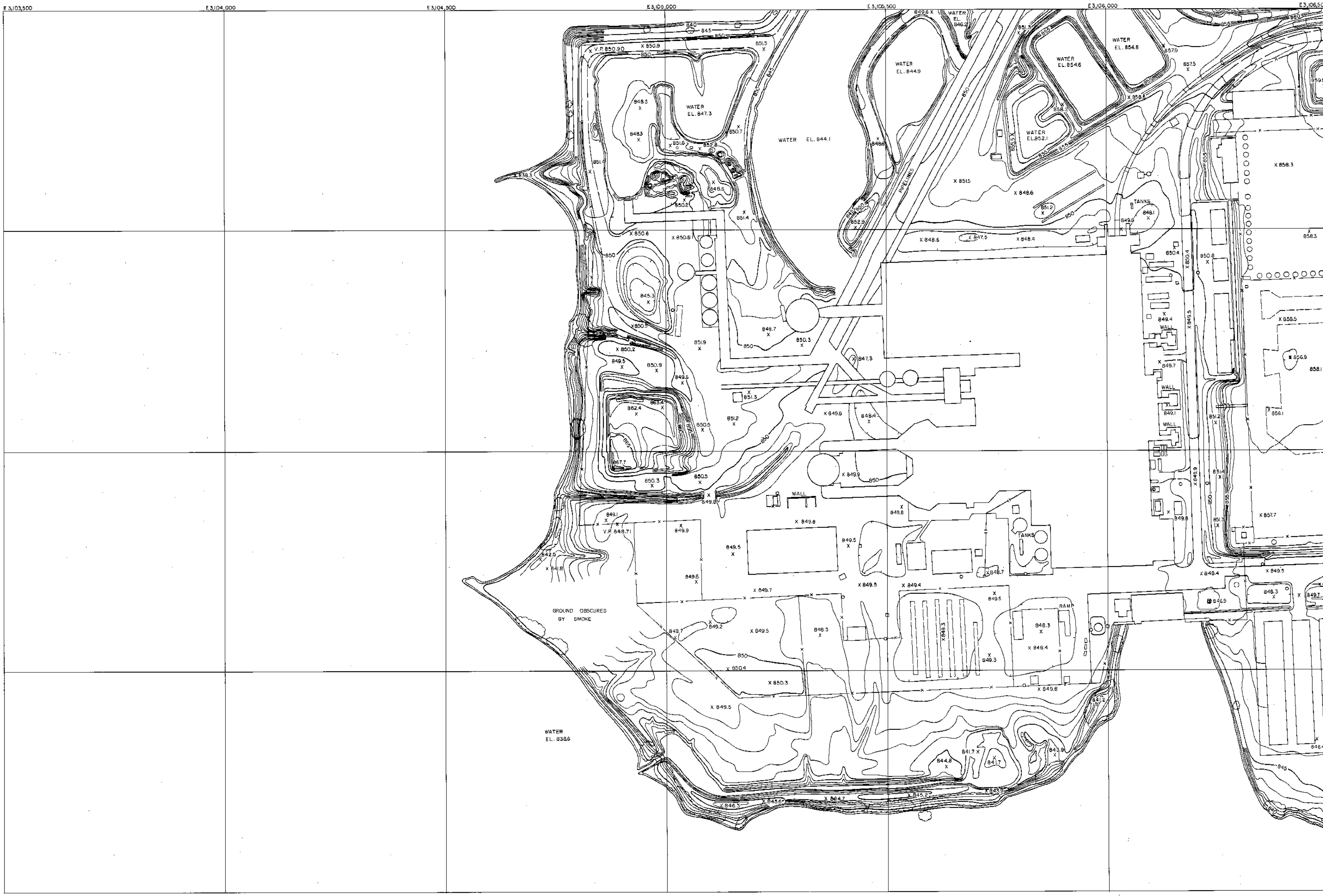
ASH POND DIKE PLAN & SECT

EBASCO SERVICES INCORPORATED NEW YORK

SCALE | APPROVED | DATE
DIV. C-H
DR.
CH.

AN8980 G-693





DATE OF PHOTOGRAPHY - AUGUST 5, 1987

TOPOGRAPHIC MAP SCALE 1" = 100' CONTOUR INTERVAL 1' SHEET 16

Compiled by Photogrammetric Means
WESTERN AIR MAPS, INC.

KANSAS CITY POWER & LIGHT CO. ENGINEERING DEPT.

LACYGNE GENERATING STATION

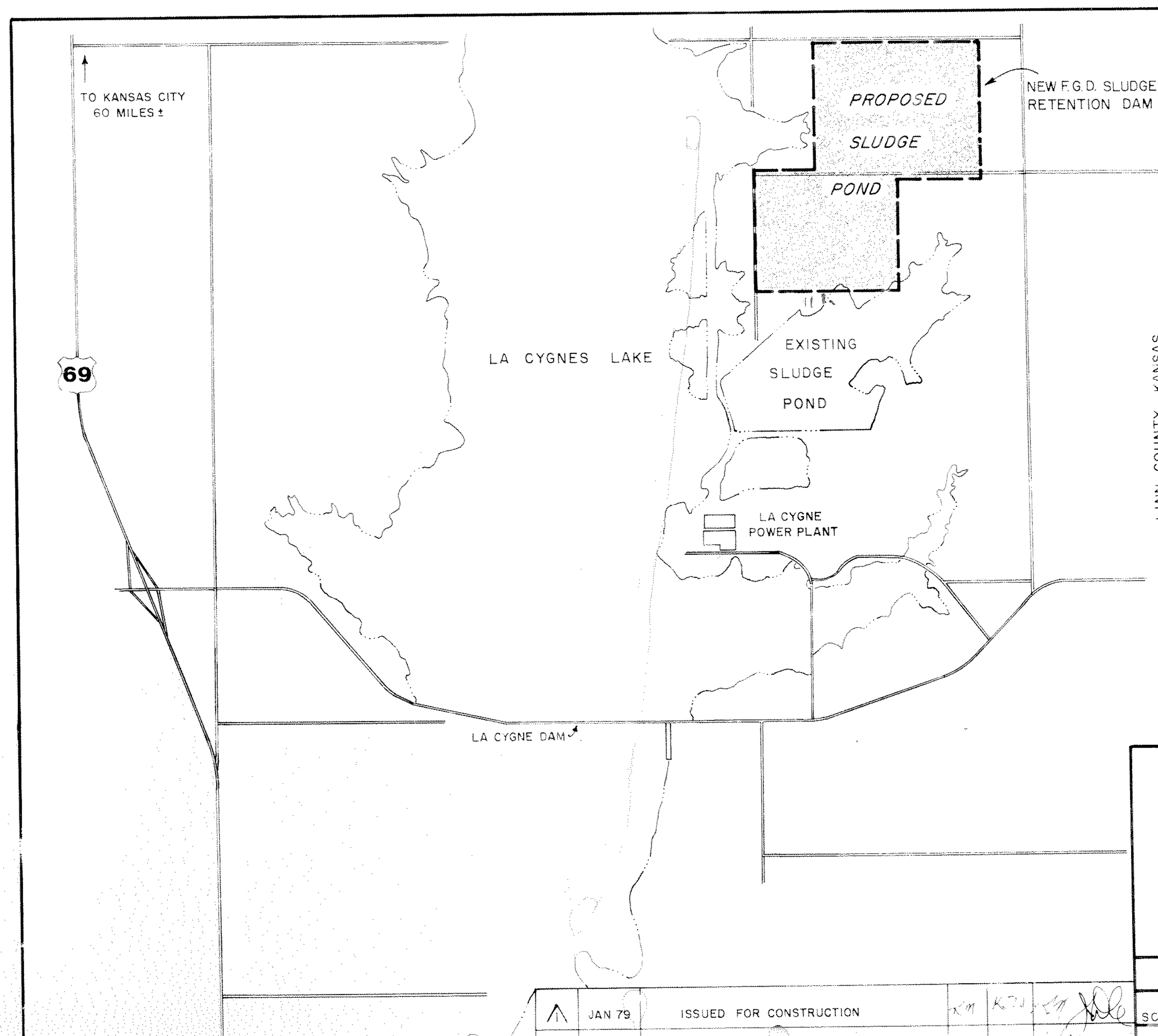
CKD. DATE APPR. DATE Job No.

Dwg. No. KC 200.80 SH. D60

LA CYGNE STATION - F.G.D. SLUDGE RETENTION DAM - STAGE 1

CONSTRUCTION OF DAM TO ELEVATION 890 FEET AND APPURTENANT STRUCTURES

LIST OF CONTRACT DRAWINGS



APPROVED
This 30TH day of JANUARY 79
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

N

0 1000 2000 3000 4000
SCALE, ft

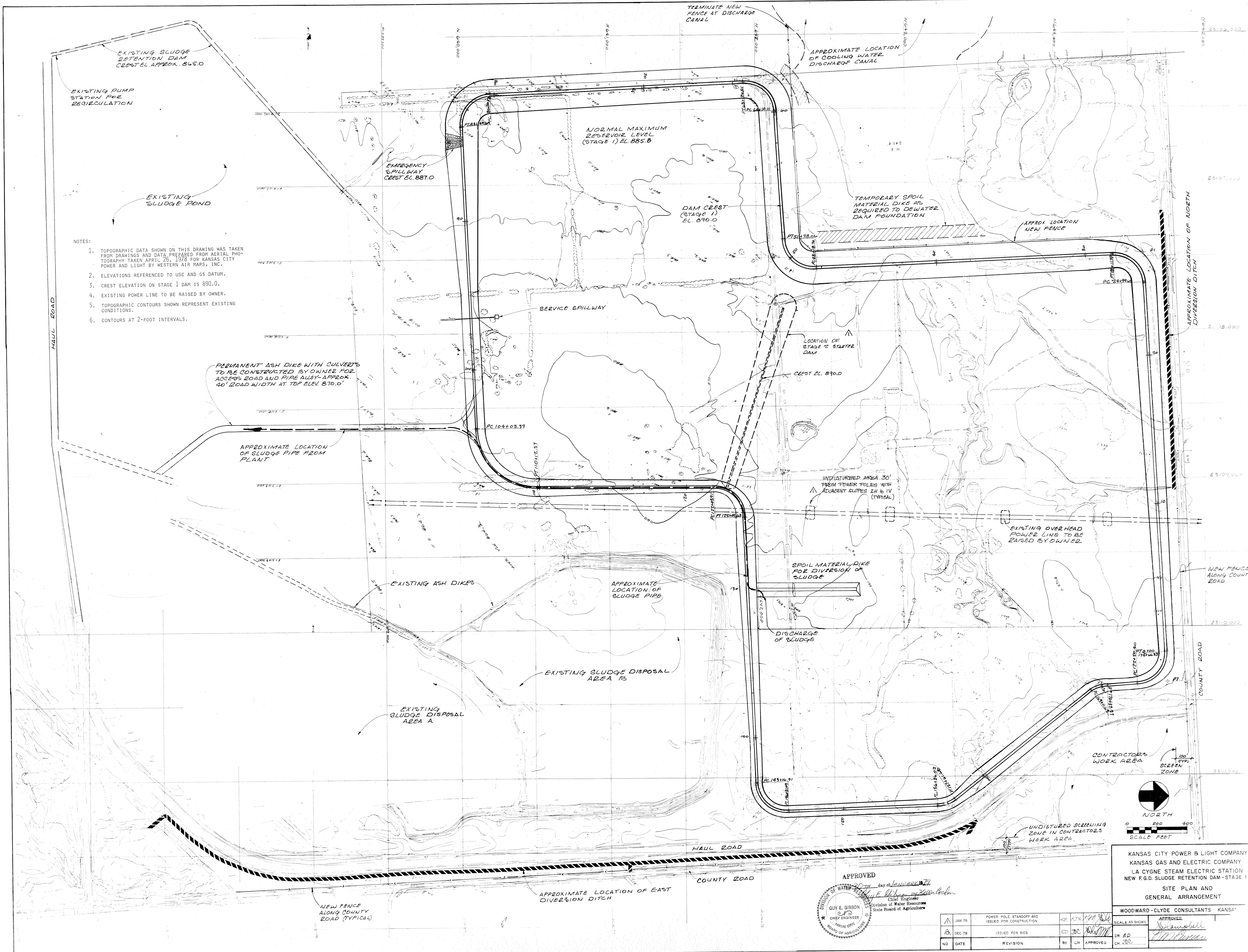
KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

SITE LOCATION PLAN

WOODWARD-CLYDE CONSULTANTS

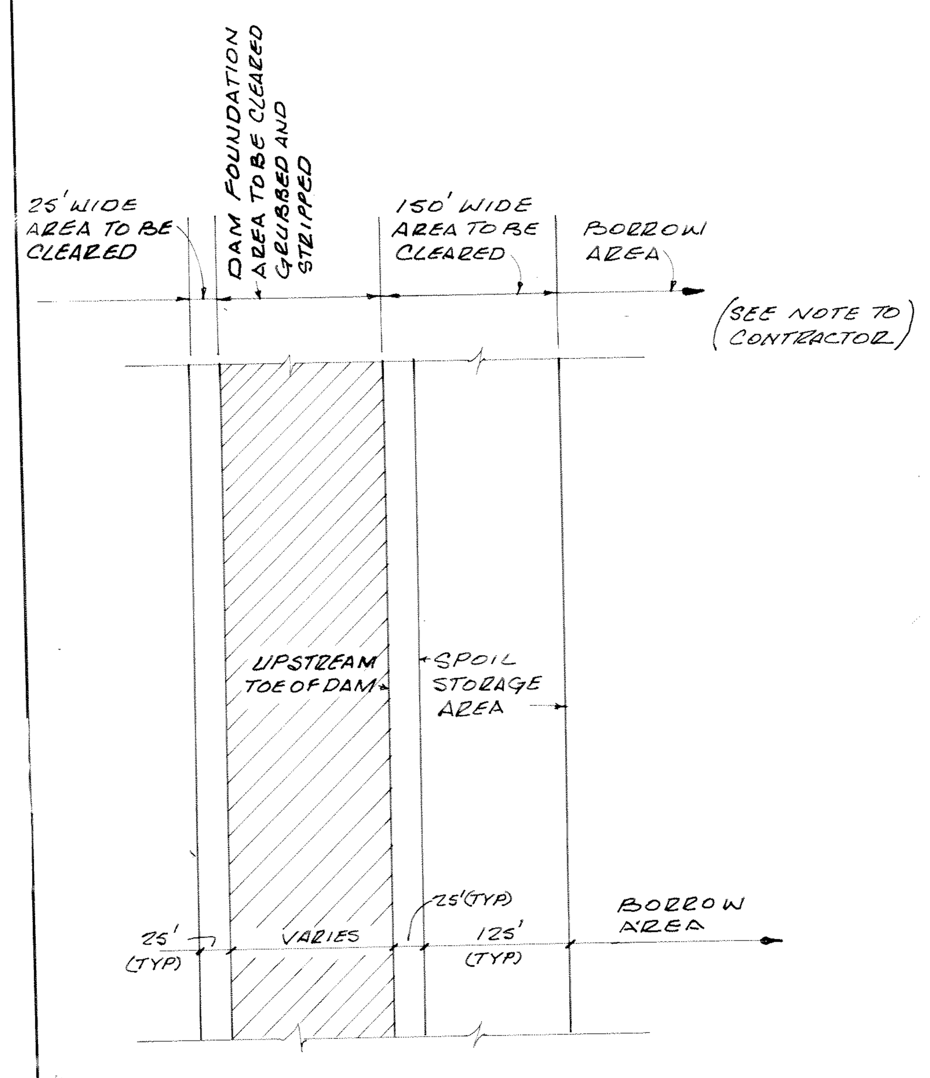
NO.	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION	KM	KJN	
0	DEC 78	ISSUED FOR BIDS	KM	JAC	

SCALE: AS SHOWN
APPROVED
DR. KM
CH. JAC


EXISTING SLUDGE RETENTION DAM CREST EL. APPROX. 865.0
EXISTING PUMP STATION FOR RECIRCULATION
TERMINATE NEW FENCE AT DISCHARGE CANAL
APPROXIMATE LOCATION OF COOLING WATER DISCHARGE CANAL
NORMAL MAXIMUM RESERVOIR LEVEL (STAGE 1) EL 885.8
EMERGENCY SPILLWAY CREST EL. 887.0
EXISTING SLUDGE POND
DAM CREST (STAGE 1) EL. 890.0
TEMPORARY SPOIL MATERIAL DIKE AS REQUIRED TO DEWATER DAM FOUNDATION
APPROX LOCATION NEW FENCE
APPROXIMATE LOCATION OF NORTH DIVERSION DITCH
NOTES:
1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
3. CREST ELEVATION ON STAGE 1 DAM IS 890.0.
4. EXISTING POWER LINE TO BE RAISED BY OWNER.
5. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
6. CONTOURS AT 2-FOOT INTERVALS.
HAUL ROAD
SERVICE SPILLWAY
LOCATION OF STAGE 2 STARTER DAM
CREST EL. 890.0
PERMANENT ASH DIKE WITH CULVERTS TO BE CONSTRUCTED BY OWNER FOR ACCESS ROAD AND PIPE ALLEY-APPROX. 40' ROAD WIDTH AT TOP ELEV. 870.0'
PC 104+03.39
APPROXIMATE LOCATION OF SLUDGE PIPE FROM PLANT
UNDISTURBED AREA 30' FROM POWER POLES WITH ADJACENT SLOPES 2H to 1V (TYPICAL)
EXISTING OVERHEAD POWER LINE TO BE RAISED BY OWNER
SPOIL MATERIAL DIKE FOR DIVERSION OF SLUDGE
EXISTING ASH DIKES
APPROXIMATE LOCATION OF SLUDGE PIPE
NEW FENCE ALONG COUNTY ROAD
DISCHARGE OF SLUDGE
EXISTING SLUDGE DISPOSAL AREA B
EXISTING SLUDGE DISPOSAL AREA A
COUNTY ROAD
CONTRACTORS WORK AREA
SCREEN ZONE
NORTH
0 200 400
SCALE FEET
UNDISTURBED SCREENING ZONE IN CONTRACTORS WORK AREA
HAUL ROAD
COUNTY ROAD
APPROXIMATE LOCATION OF EAST DIVERSION DITCH
NEW FENCE ALONG COUNTY ROAD (TYPICAL)
APPROVED
30TH day of JANUARY 1979
Guy E. Gibson by Keller Cordon
Chief Engineer
Division of Water Resources
State Board of Agriculture
DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE
BOARD OF AGRICULTURE
1 JAN 79 POWER POLE STANDOFF AND ISSUED FOR CONSTRUCTION KM KJN
0 DEC 78 ISSUED FOR BIDS ED JDC
NO DATE REVISION BY CH APPROVED
KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1
SITE PLAN AND
GENERAL ARRANGEMENT
WOODWARD-CLYDE CONSULTANTS KANSAS
SCALE: AS SHOWN
DR. ED
CH. JDC
APPROVED

NOTES:

1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
4. CONTOURS AT 2-FOOT INTERVALS.
5. ALL CLEARING, GRUBBING AND STRIPPING SHALL CONFORM TO THE TECHNICAL SPECIFICATIONS.

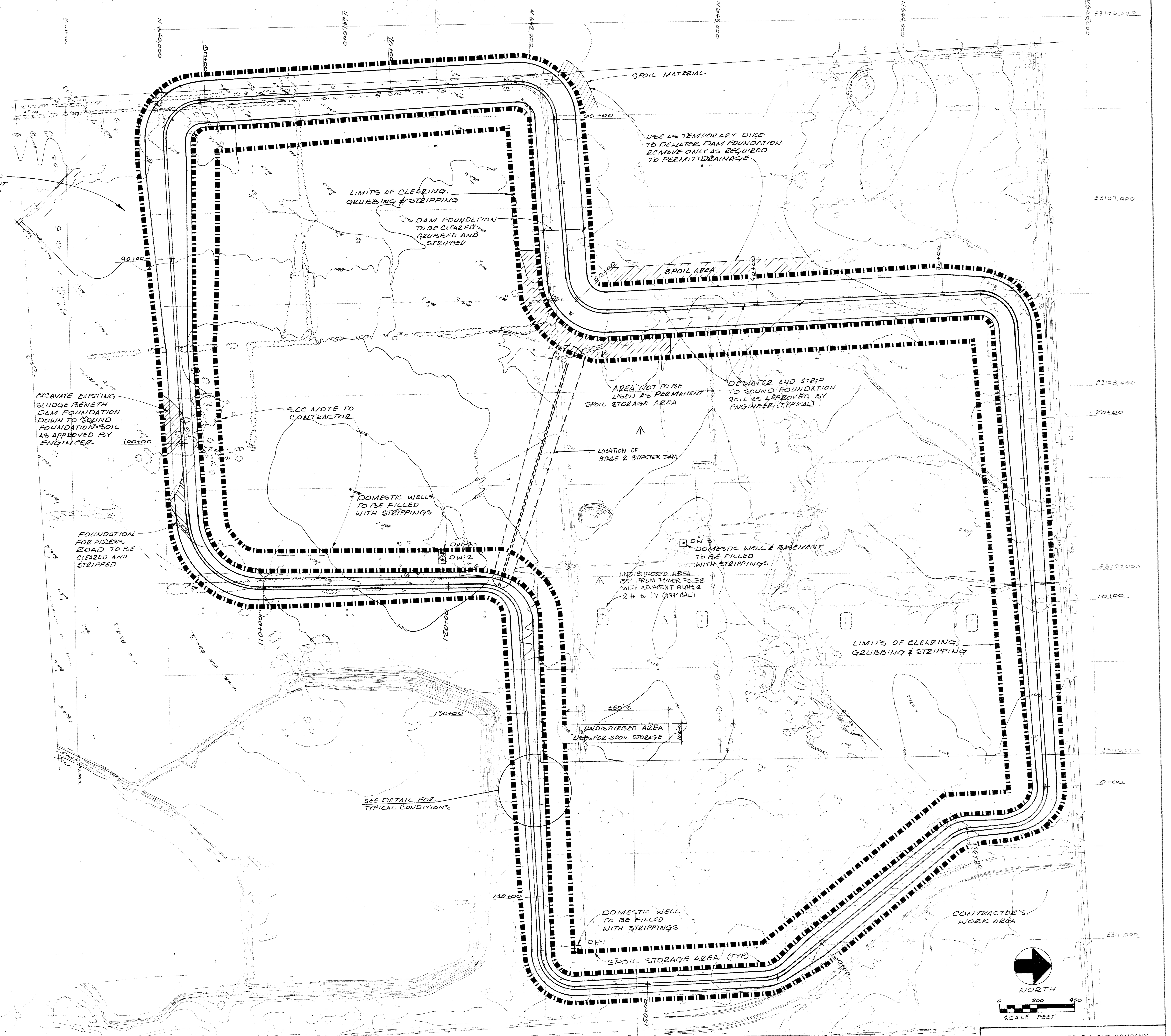


DETAIL

SCALE FEET

NOTE: TO CONTRACTOR

AREA TO BE CLEARED, GRUBBED AND STRIPPED WHERE BORROW IS OBTAINED.
AREAS NOT USED FOR BORROW TO BE USED FOR SPOIL STORAGE AS APPROVED BY ENGINEER.



APPROVED

30TH day of JANUARY 19 79

Guy E. Gibson by Keller Condon

Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES · GUY E. GIBSON · CHIEF ENGINEER · KANSAS STATE · BOARD OF AGRICULTURE

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

LIMITS OF CLEARING, GRUBBING, STRIPPING AND SPOIL AREAS

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	POWER POLE STANDOFF AND ISSUED FOR CONSTRUCTION	KM	KJN	
0	DEC 78	ISSUED FOR BIDS	ED	JDC	

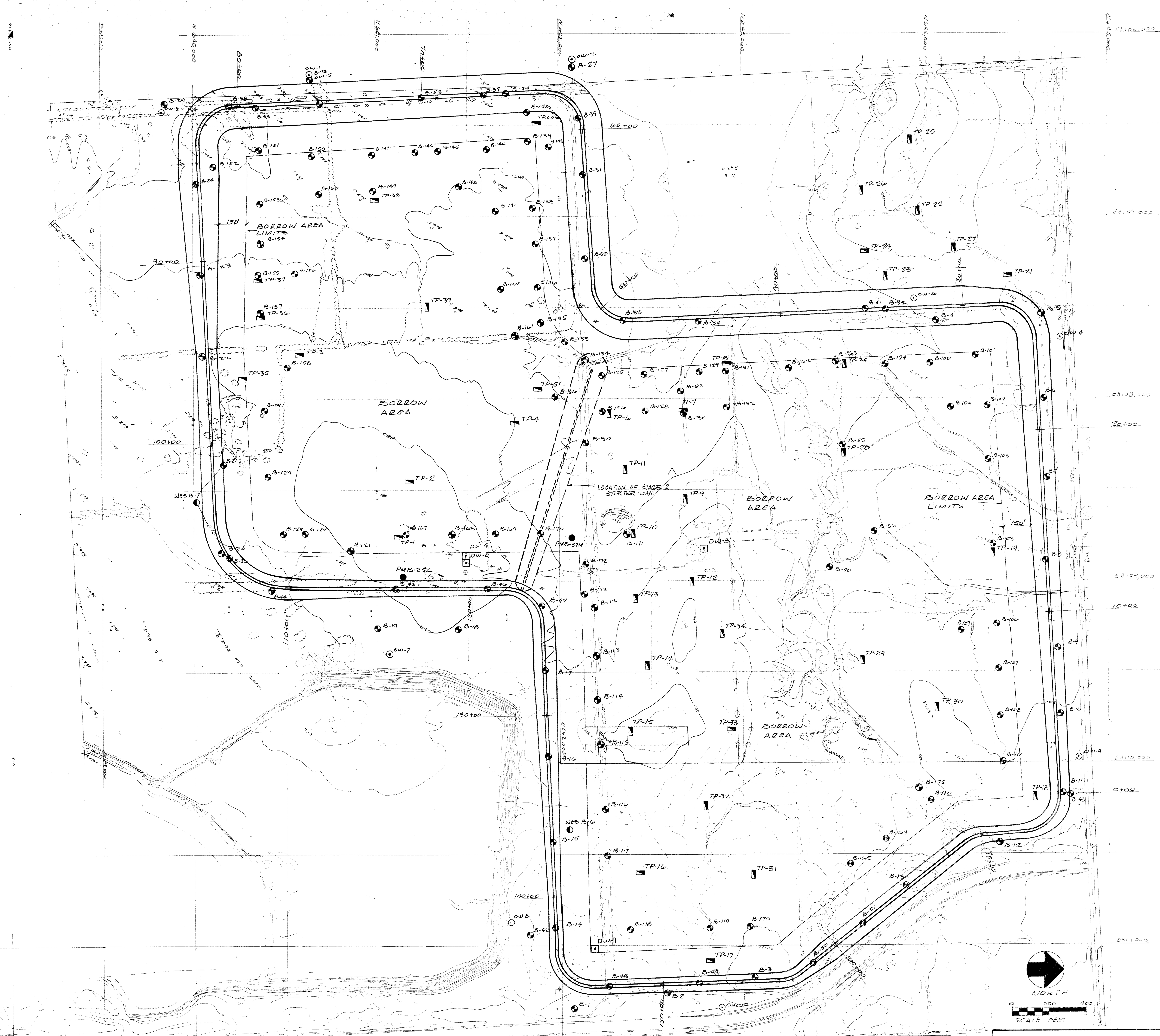
SCALE AS SHOWN
APPROVED
DATE DEC 1978
DR. ED
CH. JDC
KC 205.80
SHEET 3

NOTES:

1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
4. CONTOURS AT 2-FOOT INTERVALS.
5. ALL LOCATIONS OF BORINGS, TEST PITS, OBSERVATION WELLS, DOMESTIC WELLS, CORPS OF ENGINEERS BORING AND PITTSBURGH & MIDWAY COAL COMPANY BORING WERE MEASURED FROM CENTERLINE OF DAM.
6. ALL EXCAVATION PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.

LEGEND:

B-1	LOCATION AND NUMBER OF BORING
TP-1	LOCATION AND NUMBER OF TEST PIT
OW-1	LOCATION AND NUMBER OF OBSERVATION WELL
DW-1	LOCATION AND NUMBER OF DOMESTIC WELL TO BE FILLED
WES B-6	LOCATION AND NUMBER OF CORPS OF ENGINEERS BORING
PMB-32M	LOCATION AND NUMBER OF PITTSBURGH & MIDWAY COAL COMPANY BORING



APPROVED
30TH day of JANUARY 1979
Guy E. Gibson By Keller Gordon
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE
BOARD OF AGRICULTURE

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

BORROW AREA AND
BORING LOCATION PLAN

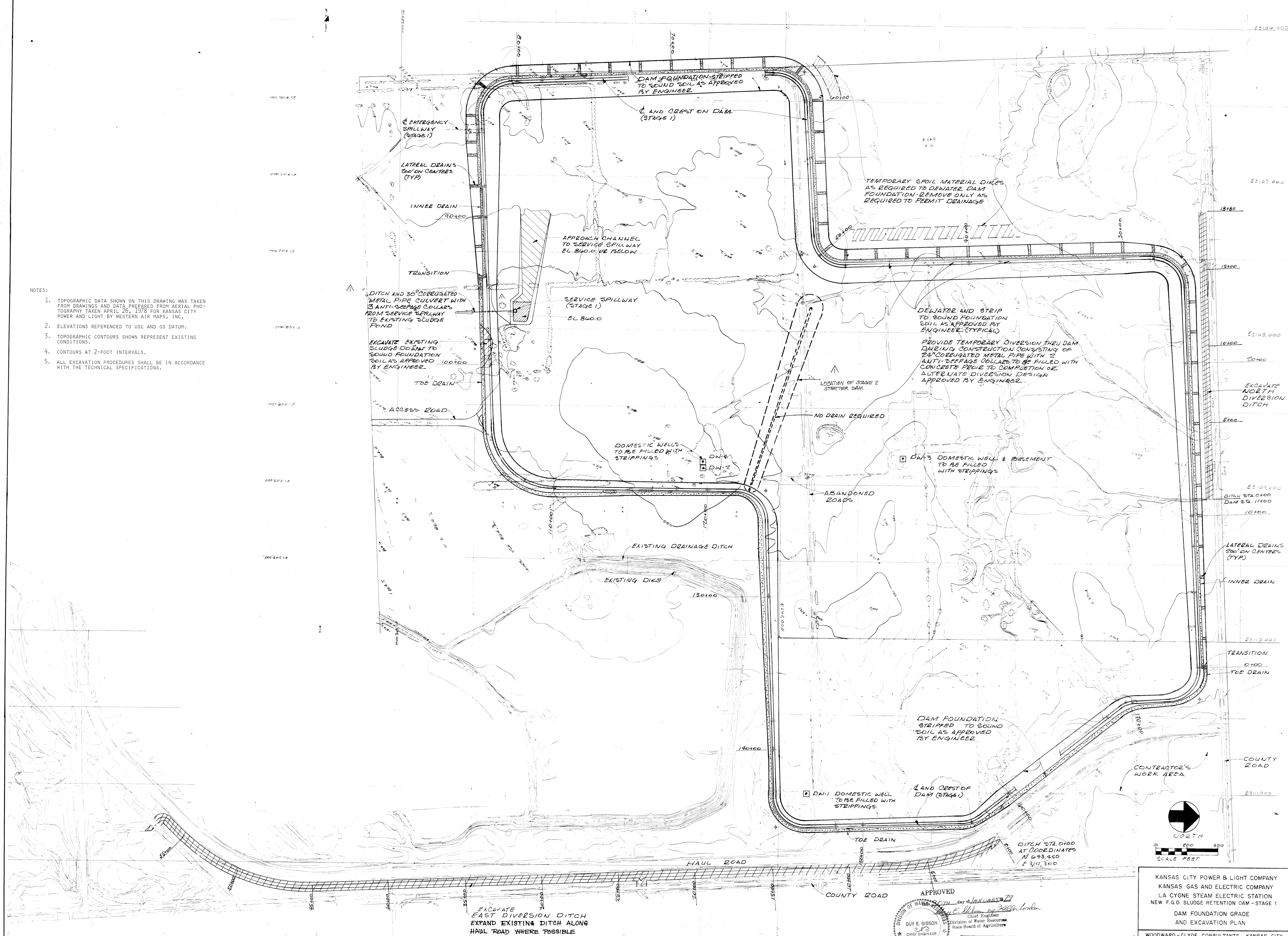
WOODWARD-CLYDE CONSULTANTS KANSAS CITY

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION	KN	KJN	
0	DEC 78	ISSUED FOR BIDS	ED	JDC	

SCALE: AS SHOWN
DR. ED
CH. JDC
APPROVED
DATE DEC 1978
KC 205.80
SHEET 4

NOTES:

1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
4. CONTOURS AT 2-FOOT INTERVALS.
5. ALL EXCAVATION PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.



APPROVED
This 30TH day of JANUARY 1979
Guy E. Gibson by Keller Lordon
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES — GUY E. GIBSON — CHIEF ENGINEER — KANSAS STATE BOARD OF AGRICULTURE

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ADD ANTI-SEEPAGE COLLAR AND ISSUED FOR CONSTRUCTION	KM	KJN	[illegible]
0	DEC 78	ISSUED FOR BIDS	ED	JDC	[illegible]

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

DAM FOUNDATION GRADE AND EXCAVATION PLAN

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

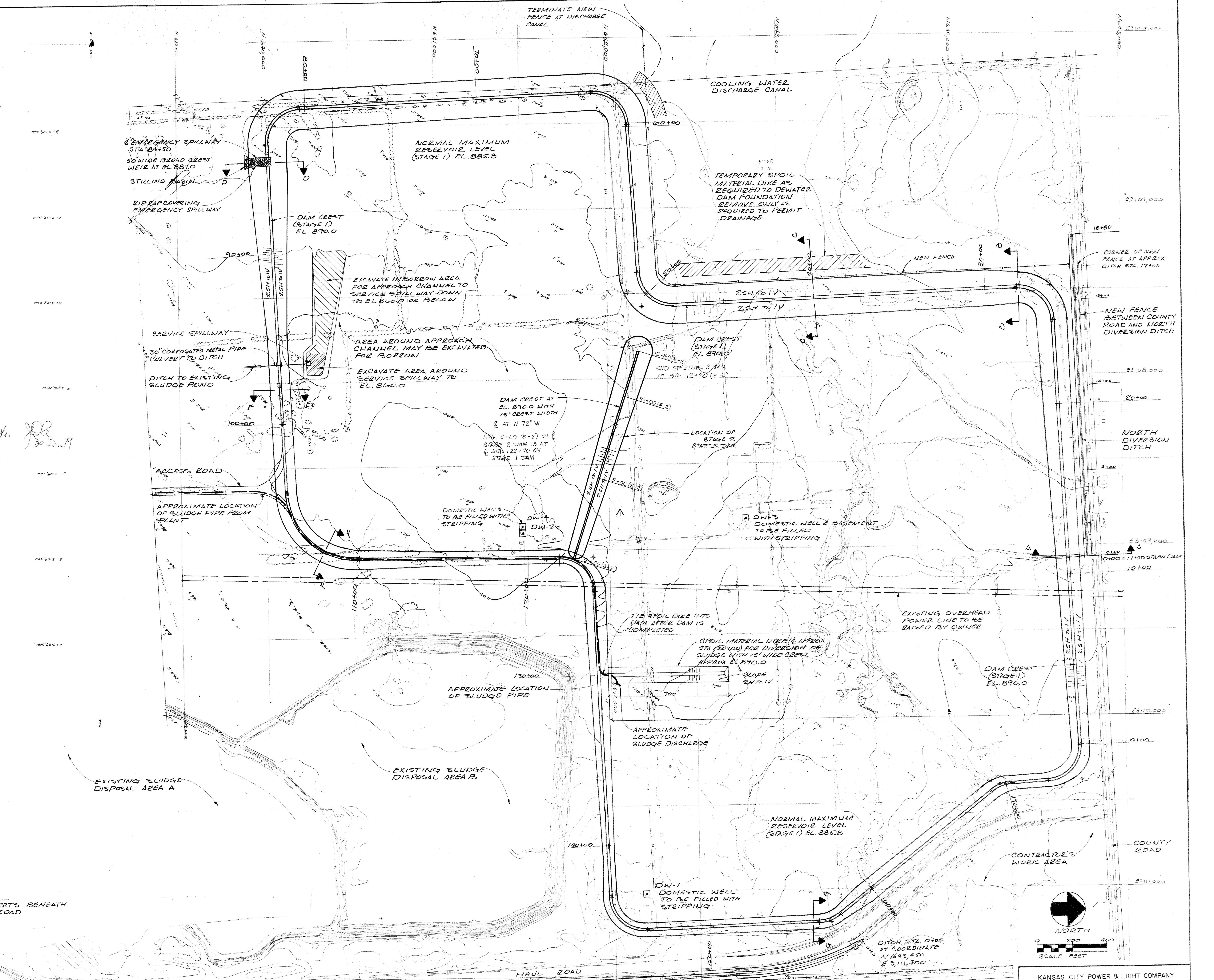
SCALE AS SHOWN
APPROVED
DATE DEC 1978
DR. ED
CH. JDC
KC 205.80
SHEET 5

NOTES:

1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED FROM USC AND GS DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
4. CONTOURS AT 2-FOOT INTERVALS.
5. ALL EXCAVATION PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
6. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
7. Crest width of dam shall be changed by a gradual transition over a 100 ft length. JDC 30 Jan 79

CREST WIDTH OF DAM

LOCATION ALONG DAM STATION	CREST WIDTH FEET	
0+00 - 24+00	13	
24+00 - 32+00	15	
32+00 - 93+00	18	
93+00 - 106+00	15	
106+00 - 114+00	15	INCLUDES AREA FOR RAMP FOR PIPE AND ROAD ACCESS
114+00 - 175+66	12	



CULVERTS BENEATH RAILROAD

COUNTY ROAD

NEW FENCE ALONG COUNTY ROAD (TYPICAL)

EAST DIVERSION DITCH

APPROVED

This 30TH day of JANUARY 1979

Guy E. Gibson By Keller Cordon

Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

NO.	DATE	REVISION	BY	CH.	APPROVED
1	JAN 79	CREST WIDTH AND STAGE 2 DAM AND ISSUED FOR CONSTRUCTION	KM	KJN	KM JDC
0	DEC 78	ISSUED FOR BIDS	ED	JDC	JDC MM

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

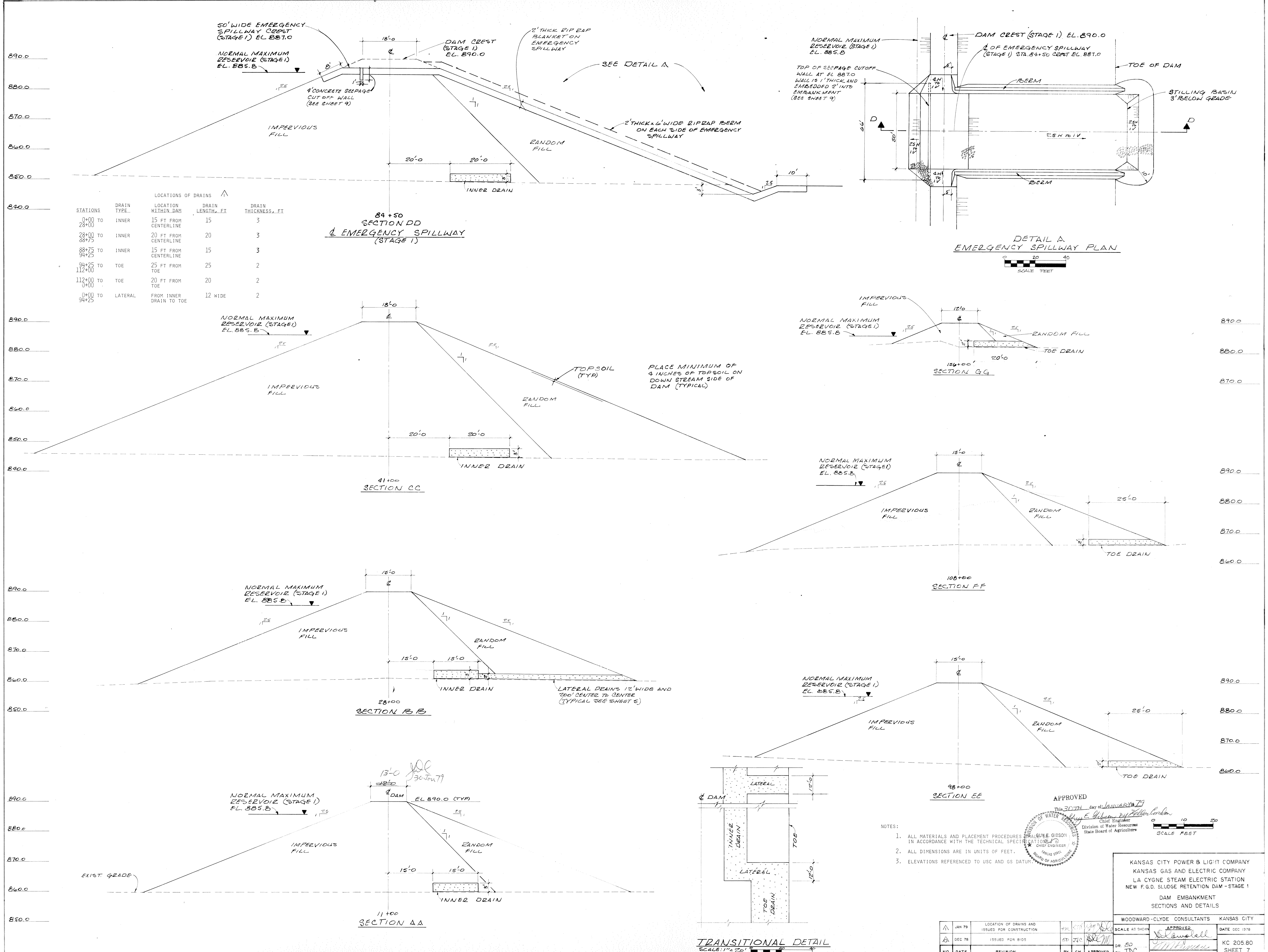
DAM AND
SPILLWAYS PLAN

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

SCALE: AS SHOWN | APPROVED: H. Campbell, M. Bunnan | DATE DEC 1978

DR. ED
CH. JDC

KC 205.80
SHEET 6



LOCATIONS OF DRAINS △1

STATIONS	DRAIN TYPE	LOCATION WITHIN DAM	DRAIN LENGTH, FT	DRAIN THICKNESS, FT
0+00 TO 28+00	INNER	15 FT FROM CENTERLINE	15	3
28+00 TO 88+75	INNER	20 FT FROM CENTERLINE	20	3
88+75 TO 94+25	INNER	15 FT FROM CENTERLINE	15	3
94+25 TO 112+00	TOE	25 FT FROM TOE	25	2
112+00 TO 0+00	TOE	20 FT FROM TOE	20	2
0+00 TO 94+25	LATERAL	FROM INNER DRAIN TO TOE	12 WIDE	2

NOTES:

1. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
2. ALL DIMENSIONS ARE IN UNITS OF FEET.
3. ELEVATIONS REFERENCED TO USC AND GS DATUM.

APPROVED
This 30TH day of JANUARY 1979
Guy E. Gibson BY Keller Cordon
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

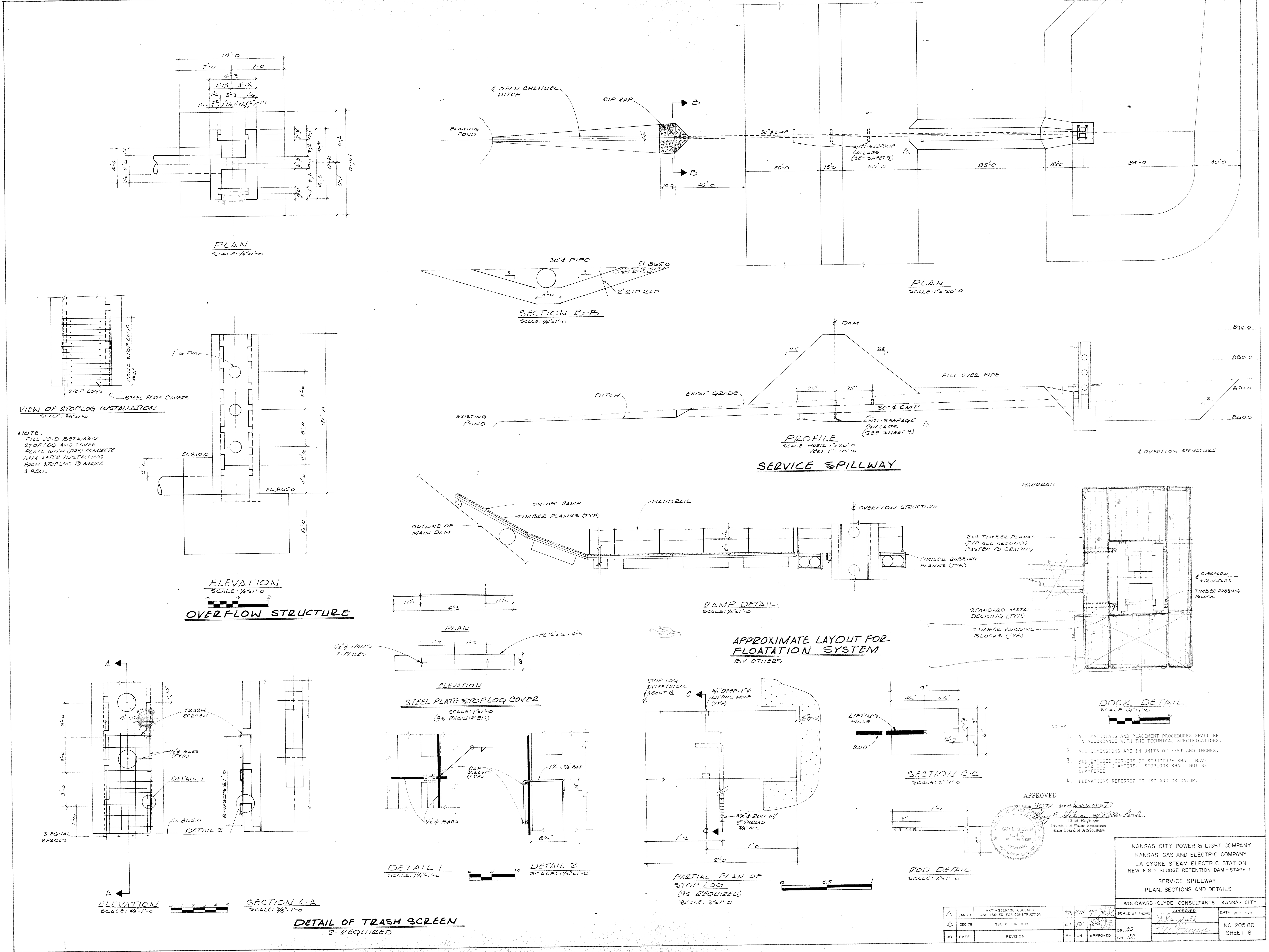
NO.	DATE	REVISION	BY	CH.	APPROVED
△1	JAN 79	LOCATION OF DRAINS AND ISSUED FOR CONSTRUCTION	KM	KJN	KM JDC
△0	DEC 78	ISSUED FOR BIDS	ED	JDC	JDC MM

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

DAM EMBANKMENT
SECTIONS AND DETAILS

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

SCALE AS SHOWN
APPROVED
DATE DEC 1978
DR. ED
CH. JDC
KC 205.80
SHEET 7



NOTES:

1. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
2. ALL DIMENSIONS ARE IN UNITS OF FEET AND INCHES.
3. ALL EXPOSED CORNERS OF STRUCTURE SHALL HAVE 1 1/2 INCH CHAMFERS. STOPLOGS SHALL NOT BE CHAMFERED.
4. ELEVATIONS REFERRED TO USC AND GS DATUM.

APPROVED

This 30TH day of JANUARY 1979

Guy E. Gibson by Keller Cordon

Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES — GUY E. GIBSON — CHIEF ENGINEER — KANSAS STATE BOARD OF AGRICULTURE

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

SERVICE SPILLWAY
PLAN, SECTIONS AND DETAILS

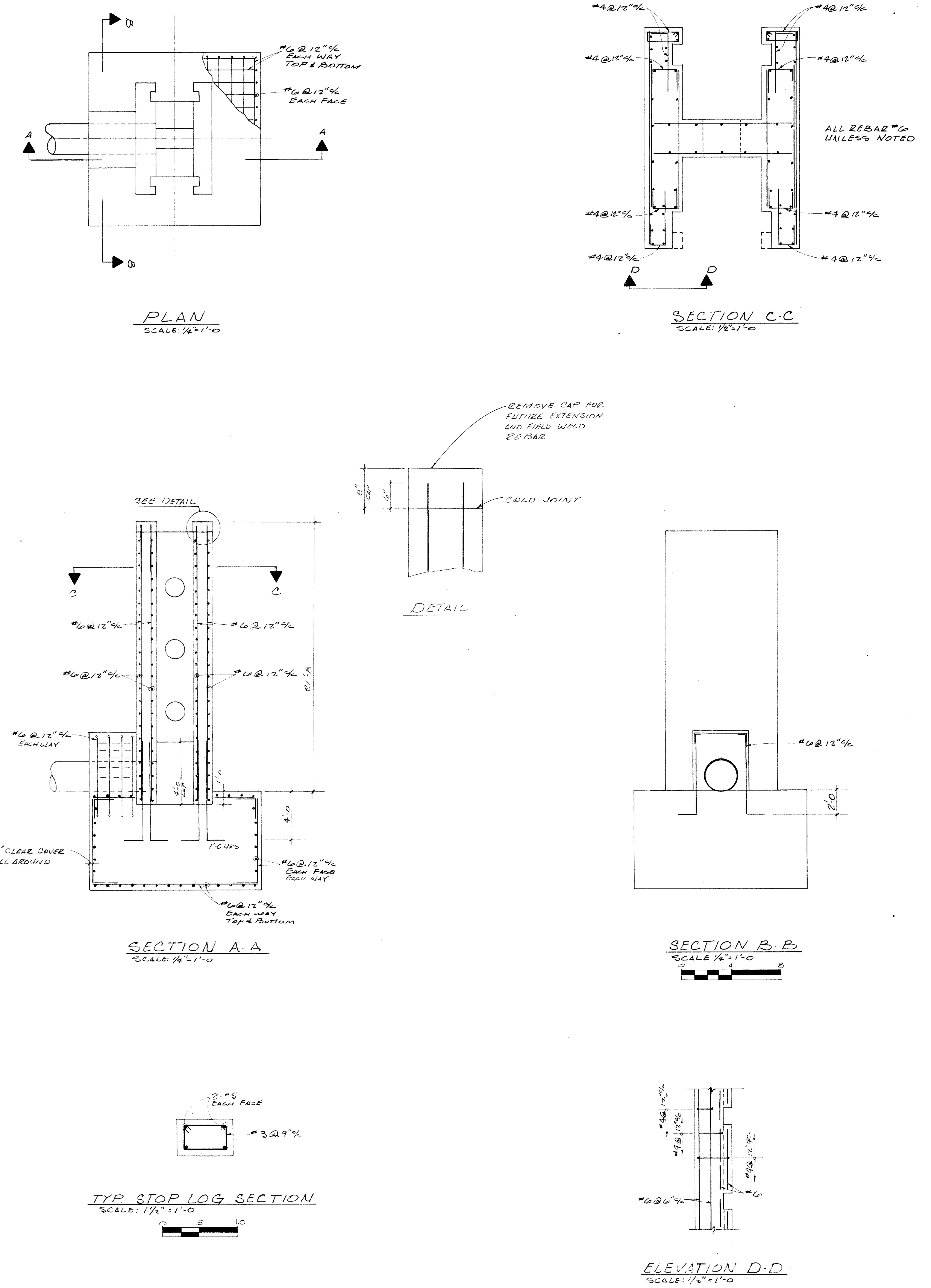
WOODWARD-CLYDE CONSULTANTS KANSAS CITY

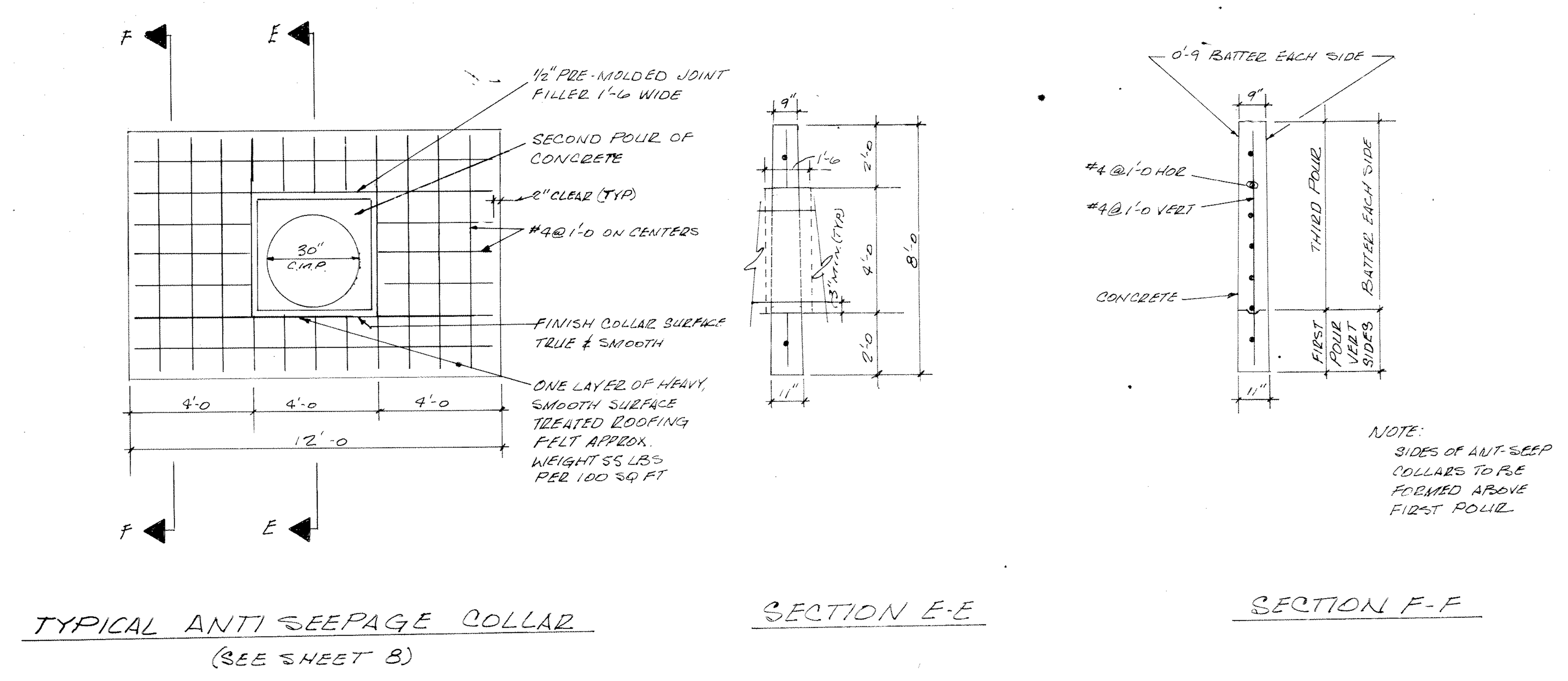
NO.	DATE	REVISION	BY	CH.	APPROVED
1	JAN 79	ANTI-SEEPAGE COLLARS AND ISSUED FOR CONSTRUCTION	KM	KJN	
0	DEC 78	ISSUED FOR BIDS	ED	JDC	

SCALE: AS SHOWN — APPROVED — DATE DEC 1978

DR. ED — CH. JDC

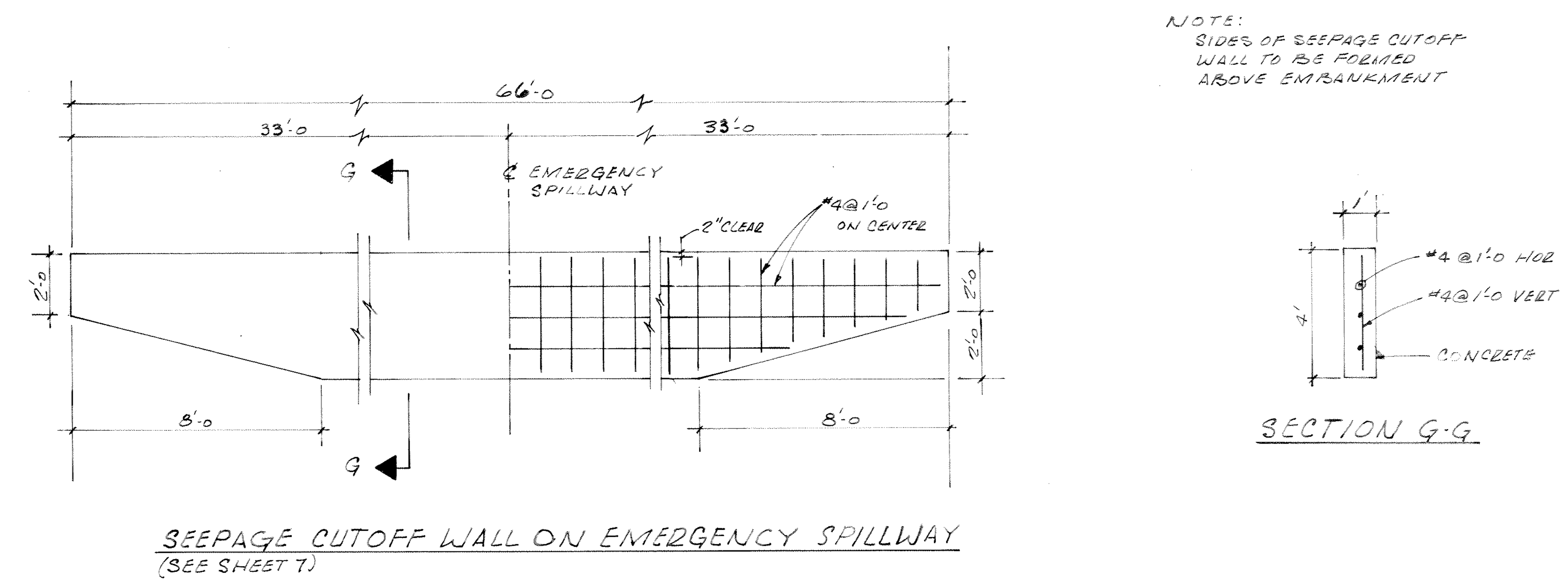
KC 205.80
SHEET 8





NOTES:

1. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
2. ALL DIMENSIONS ARE IN UNITS OF FEET AND INCHES.
3. SPLICES IN REINFORCING STEEL SHALL BE LAPPED OVER A LENGTH OF NOT LESS THAN 12 INCHES.
4. ALL EXPOSED STEEL SHALL BE PROTECTED FROM CORROSION BY A MINIMUM OF TWO COATS LEAD BASED PAINT.
5. ELEVATIONS REFERRED TO USC AND GS DATUM.
6. DEFORMED BILLET STEEL REINFORCING BARS SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATION A615-68, GRADE 60 STEEL EXCEPT USE GRADE 40 STEEL FOR MULTIPLE BEND BARS.



APPROVED
this 30TH day of JANUARY 1979
Guy E. Gibson By Keller Cordon
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM – STAGE 1

SERVICE SPILLWAY
REINFORCING

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION	KM	KJN	[illegible]
0	DEC 78	ISSUED FOR BIDS	ED	JDC	[illegible]

SCALE: AS SHOWN
APPROVED: J. Campbell
DR. ED
CH. JDC
DATE DEC 1978
KC 205.80
SHEET 9

NOTES:

1. ALL DITCH AREAS SHALL BE LANDSCAPED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. LANDSCAPING OF DITCHES SHALL CONSIST OF APPLYING FERTILIZER, SEED AND MULCH.
2. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
3. ALL DIMENSIONS ARE IN UNITS OF FEET.
4. ELEVATIONS REFERENCED TO USC AND GS DATUM.

APPROVED
This 30TH day of JANUARY 1979
Guy E. Gibson by Keller Cordon
Chief Engineer
Division of Water Resources
State Board of Agriculture

DIVISION OF WATER RESOURCES
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

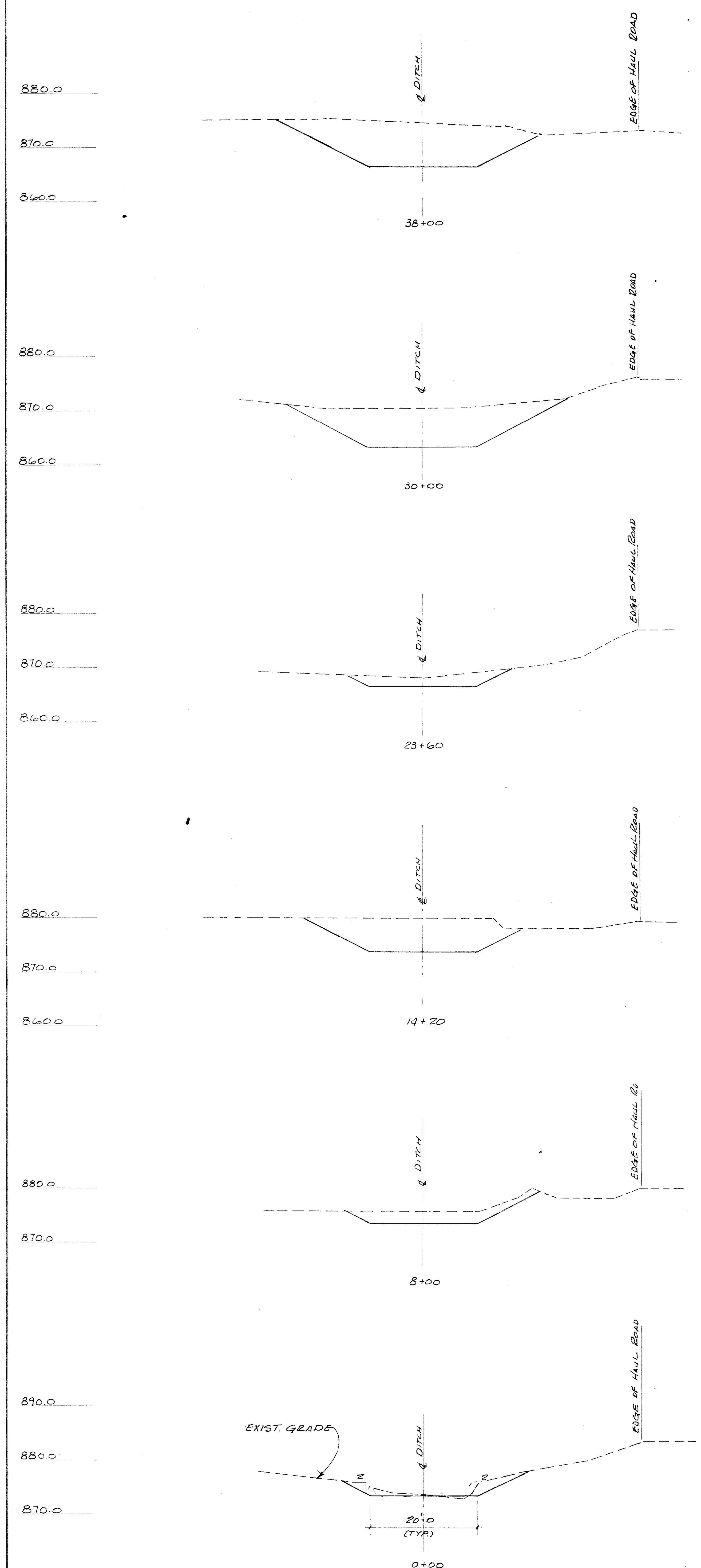
KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

DIVERSION DITCHES
PLAN AND PROFILE

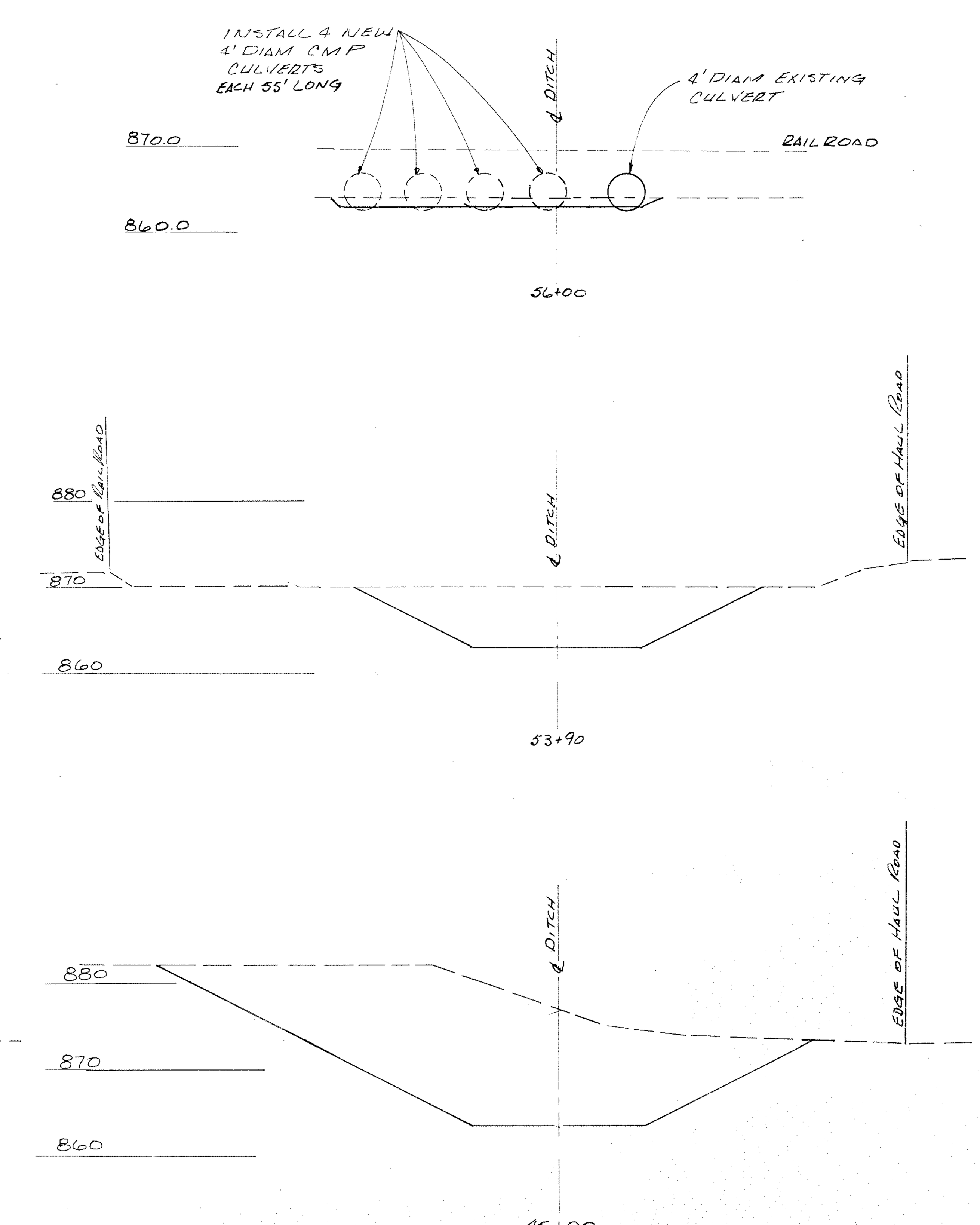
WOODWARD-CLYDE CONSULTANTS KANSAS CITY

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION	KJN	KJN	JDC
0	DEC 78	ISSUED FOR BIDS	ED	JDC	JDC

SCALE: AS SHOWN
DR. ED
CH. JDC
APPROVED
DATE: DEC 1978
KC 205.80
SHEET 10

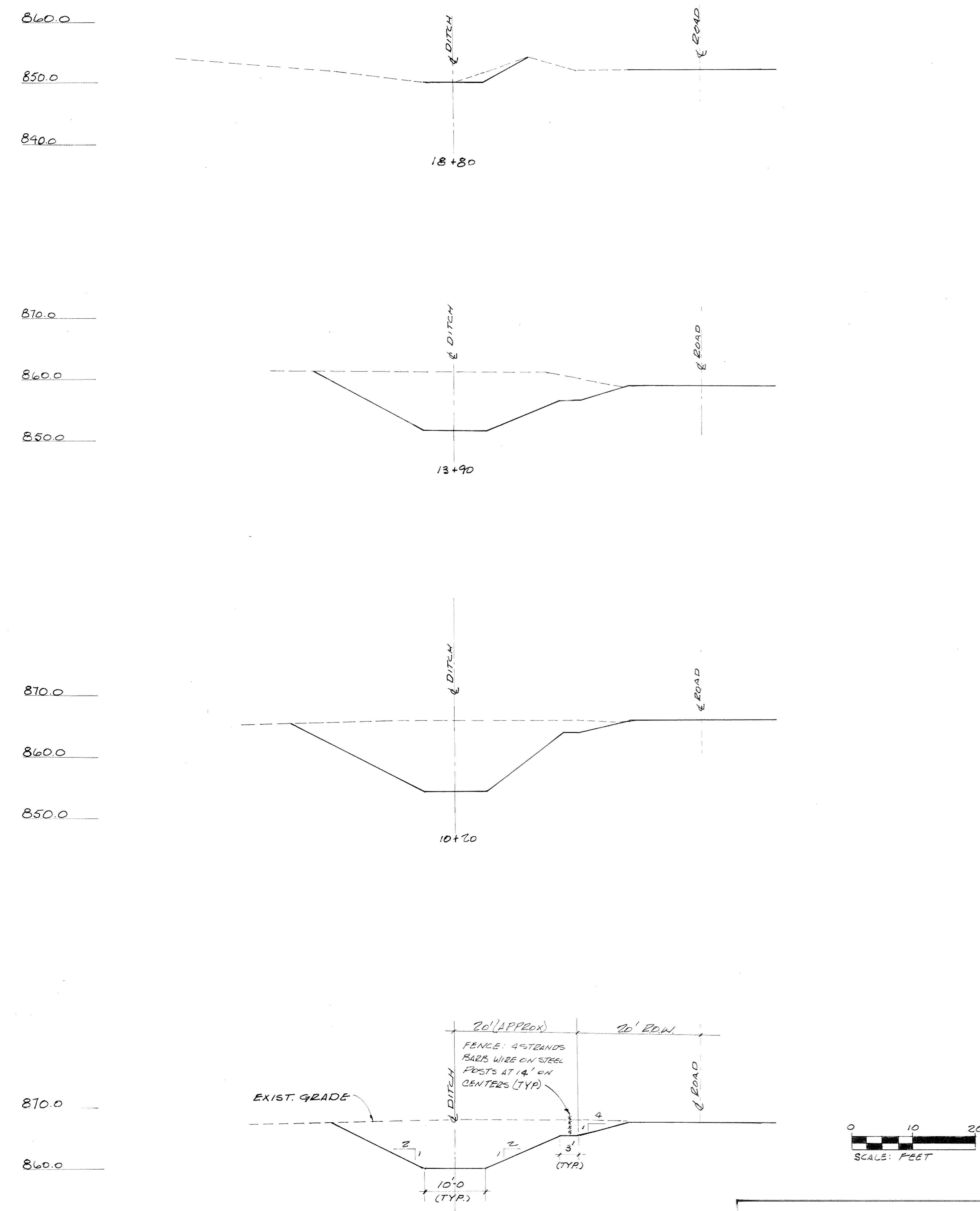


EAST DITCH



NOTES:

1. ALL DITCH AREAS SHALL BE LANDSCAPED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. LANDSCAPING OF DITCHES SHALL CONSIST OF APPLYING FERTILIZER, SEED AND MULCH.
2. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
3. ALL DIMENSIONS ARE IN UNITS OF FEET.
4. ELEVATIONS REFERENCED TO USC AND GS DATUM.



NORTH DITCH

0 10 20
SCALE: FEET

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM – STAGE 1

DIVERSION DITCHES
SECTIONS AND DETAILS

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

NO	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION		KJN	
0	DEC 78	ISSUED FOR BIDS	ED	JDC	

SCALE: AS SHOWN
APPROVED
DATE DEC 1978
DR. ED
CH. JDC
KC 205.80
SHEET 11

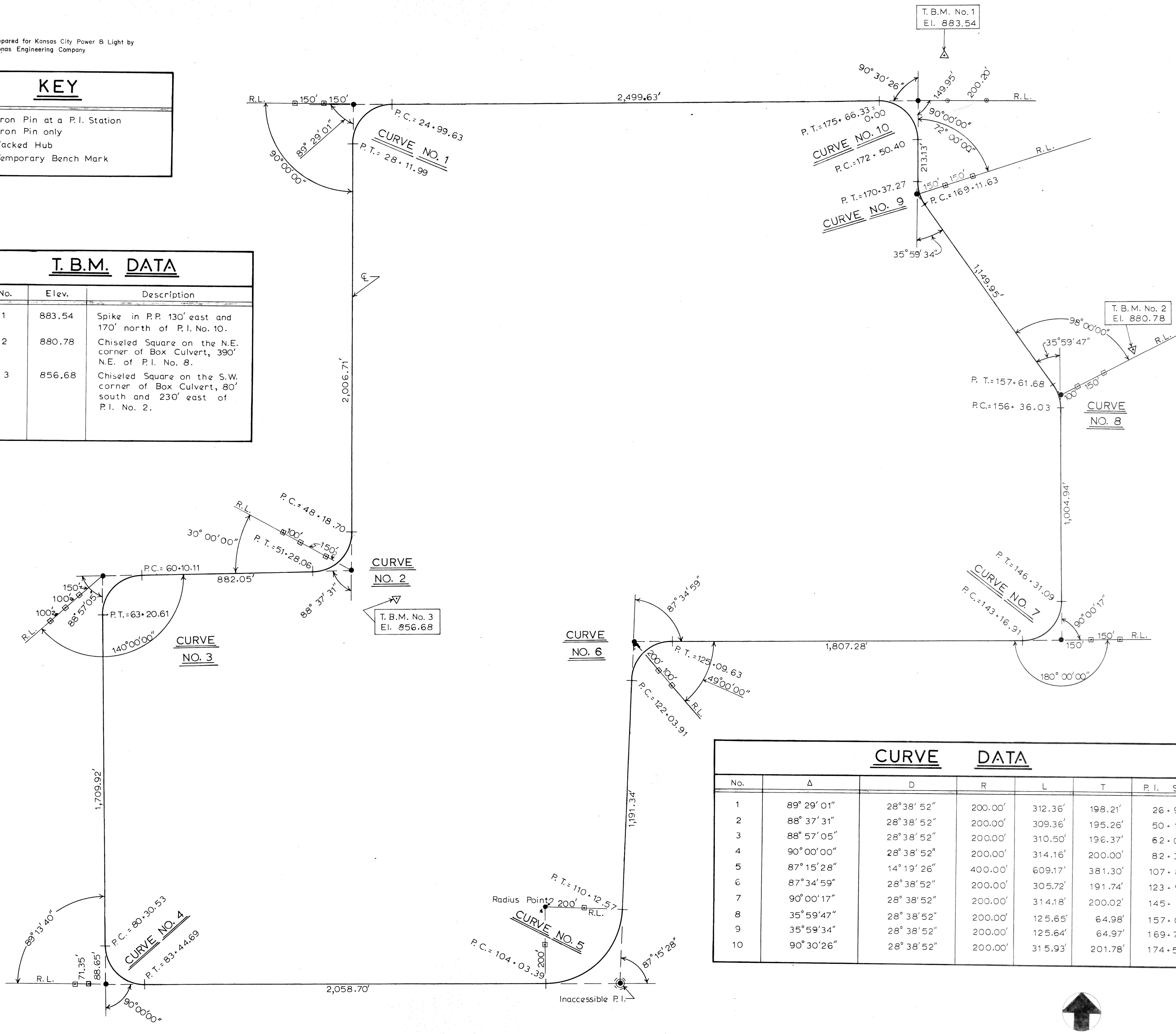
Survey Control prepared for Kansas City Power & Light by
Jonas Engineering Company

KEY

- ● = Iron Pin at a P. I. Station
- ⊙ = Iron Pin only
- ⊡ = Tacked Hub
- △ = Temporary Bench Mark

T. B. M. DATA

No.	Elev.	Description
1	883.54	Spike in P.P. 130' east and 170' north of P. I. No. 10.
2	880.78	Chiseled Square on the N.E. corner of Box Culvert, 390' N.E. of P. I. No. 8.
3	856.68	Chiseled Square on the S.W. corner of Box Culvert, 80' south and 230' east of P. I. No. 2.



CURVE DATA

No.	Δ	D	R	L	T	P. I. Station
1	89° 29' 01"	28° 38' 52"	200.00'	312.36'	198.21'	26 + 97.84
2	88° 37' 31"	28° 38' 52"	200.00'	309.36'	195.26'	50 + 13.95
3	88° 57' 05"	28° 38' 52"	200.00'	310.50'	196.37'	62 + 06.48
4	90° 00' 00"	28° 38' 52"	200.00'	314.16'	200.00'	82 + 30.53
5	87° 15' 28"	14° 19' 26"	400.00'	609.17'	381.30'	107 + 84.69
6	87° 34' 59"	28° 38' 52"	200.00'	305.72'	191.74'	123 + 95.65
7	90° 00' 17"	28° 38' 52"	200.00'	314.18'	200.02'	145 + 16.93
8	35° 59' 47"	28° 38' 52"	200.00'	125.65'	64.98'	157 + 01.01
9	35° 59' 34"	28° 38' 52"	200.00'	125.64'	64.97'	169 + 76.60
10	90° 30' 26"	28° 38' 52"	200.00'	315.93'	201.78'	174 + 52.18